JUL -9 1957

JULY, 1957

# METAL FINISHING

DEVOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

FOUNDED 1903

THE LIBRARY OF CONGRESS SERIAL RECORD JUL 17 1957

**Electroplating in the Construction of a Man-made Satellite**
*Electroplating an Important Step*

**Racks for Anodizing**
*Construction for Maximum Efficiency*

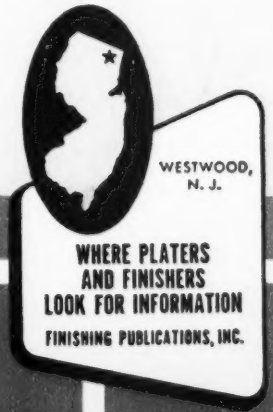
**What Size Filter?**
*Calculation of Required Flow Rates*

**Institute of Metal Finishing: 1957 Annual Conference**
*Abstracts of Technical Papers*

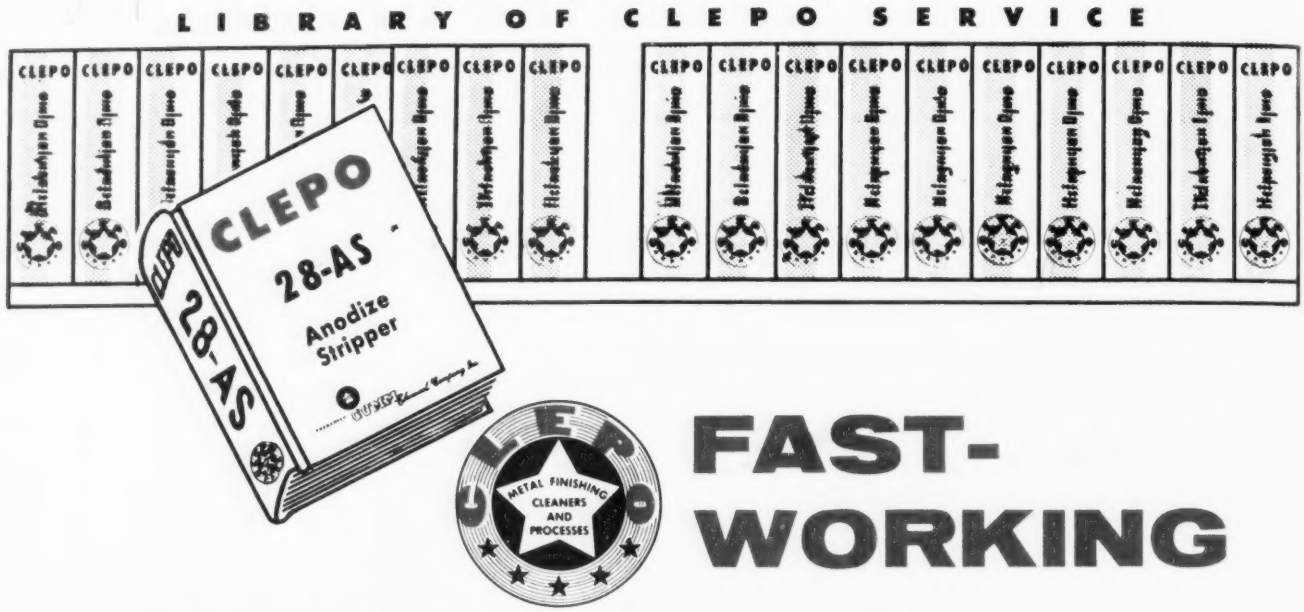
**Finishing Pointers**
*Life of Alkaline Cleaning Baths*

**Science for Electroplaters**
*Waste Disposal*

**Complete Contents Page 37**




READ & PASS ON




CLEPO — METAL FINISHING CLEANERS AND PROCESSES

# FAST-WORKING

# 28-AS

# ANODIZE STRIPPER

- it's an alkaline powdered compound
- dissolves readily in tap water at room temperature; mild steel tank can be used
- very stable; quantity can be made up in advance
- negligible attack on base metal under normal application
- strips racks without alkaline pre-clean
- Available in 500 pound drums or small quantities.

The effectiveness of and simplicity of preparation and handling makes CLEPO 28-AS the preferred 'stripper' in many plants anodizing aluminum products.

CLEPO 28-AS provides another example of the broad-scale service Gumm Technicians are rendering your industry. They are in position to offer many CLEPO formulations to take care of the many cleaning, stripping, etching and other problems. And CLEPO Field Men are always ready to help in setting up better methods and to recommend better compounds.

If you are working on anodized products, try CLEPO 28-AS. Make a thorough test along side of your present methods. If you are working on other metals why not discuss your problems with the CLEPO Field Representative? You will find CLEPO Products most effective compounds.

FREDERICK GUMM *Chemical Company Inc.*

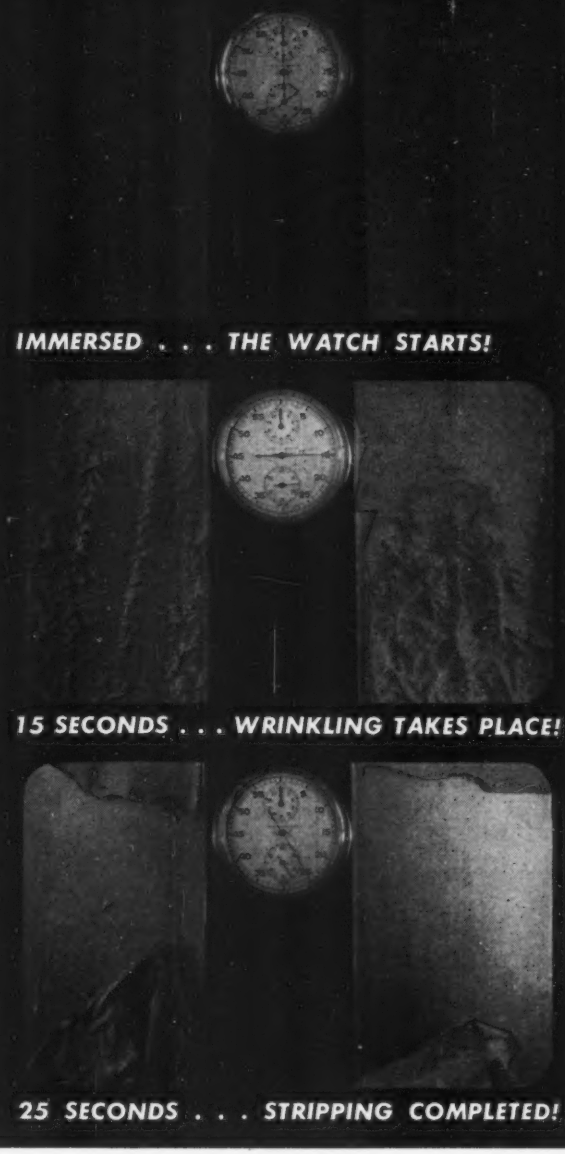
538 FOREST STREET, KEARNY, N.J.

JUL -9 1957 TS550 .M3


# STRIPPING ENAMEL . . .

# SAVING TIME

*Enthonics** AT WORK




## *25 seconds from immersion to completed stripping!*

**That's the fast, dramatic story of ENTHONE Enamel Stripper S-18 in action — another example of *Enthonics** at work.**

Enthone Enamel Stripper S-18 is the modern organic stripper developed for removing the newest organic finishes such as Epon or Epoxy coatings and many synthetic enamels from copper, copper alloys, steel and aluminum.

For the right strippers to solve your organic stripping problems fill out a questionnaire we'll send at your request; return it with typical samples of your work. Enthonics will find the answer . . . without obligation!

And ask for your copy of the "Enthone Check List" of literature covering more than 60 products and processes developed for modern electroplating and metal finishing.

Service Representatives and Stock Points in Principal Cities of U.S.A. and Canada, Brazil, England, France, Sweden, and Germany

ENTHONE INCORPORATED

**442 ELM STREET, NEW HAVEN 11, CONNECTICUT**

*Metal Finishing Processes • Electroplating Chemicals*

** The Scientific Solution of Metal Finishing Problems*

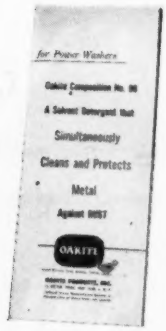
# These Oakite shortcuts speed your metal cleaning

**1** **Cleaning and rustproofing—*in one washing operation***

Oakite Composition No. 98 (used cold or hot in one-stage or two-stage washing machines) removes cutting oils and chips—while it leaves a thin film that protects steel against rusting between operations or during temporary storage.

Excellent for cleaning before inspection: the metal is cool for immediate handling and the film (too thin to affect measurements) prevents finger prints from corroding highly finished surfaces.

One auto manufacturer uses No. 98 in seven plants for cleaning and rustproofing brake cylinders, camshafts, connecting rods, crankshafts, cylinder heads, flywheels, push rods, tappets, wrist pins, etc.

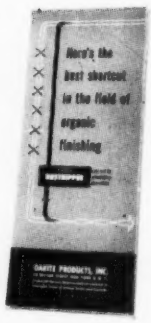



**2** **Stripping pigmented paints—*with no need for pickling before repainting***

Oakite Rustripper saves money in paint shops by doing a complete stripping job in one operation. It eliminates extra pickling and neutralizing to remove the metallic pigments, phosphate coatings and rust that prevent successful repainting.

A television manufacturer says "We formerly took 25 minutes to strip rejected cabinets, then had to pickle to remove tarnished phosphate coatings. Today 10 minutes in Rustripper strips the same cabinet so bright and clean you can't tell it from new. Eliminates pickle, neutralize and rinses."

An auto parts maker uses Rustripper for continuous conveyor line stripping. "Cycle of 1 minute and 50 seconds works like a charm stripping paint and incidental rust from rejects and hooks."

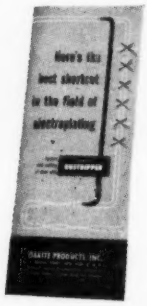



**3** **Cleaning, derusting and descaling—*in one alkaline tank***

Oakite Rustripper saves money in plating shops by removing rust or heat scale at the same time it removes oil and other soils. Alkaline pickling with Rustripper avoids hydrogen embrittlement, etching of machined surfaces and other disadvantages of acid pickling. Rustripper is also used for precleaning or electrocleaning in plating lines.

An aircraft manufacturer who formerly sand blasted to remove heat scale says "Now the scale is removed in 30 minutes in a boiling soak in Rustripper."

A job plater who adds Rustripper to his reverse-current cleaner in an automatic plating machine, says "We used to clean 45 seconds. Now 20 seconds cleans sparkling bright . . . saves precious time . . ."




**FREE** Write for booklets

**OAKITE PRODUCTS, INC., 18 Rector St., New York 6, N. Y.**

Send me the FREE booklets indicated below:

1. "For Power Washers—Oakite Composition No. 98"
2. "Here's the best shortcut in the field of organic finishing"
3. "Here's the best shortcut in the field of electroplating"

NAME_____

COMPANY_____

ADDRESS_____

Technical Service Representatives in Principal Cities of U. S. and Canada

Export Division
Cable Address: Oakite

OAKITE SCIENCE

4/Circle on Readers' Service Card

**Metal Finishing is published monthly by the Finishing Publications, Inc., 381 Broadway, Westwood, New Jersey, U.S.A. Entered as second class matter at the Post Office in Westwood, N. J. Volume 55, No. 7, July, 1957. Four Dollars Per Year.**

# *For 59 Years* ...L'HOMMEDIEU...

## *year after year has manufactured Reliance Plating, Polishing Equipment, Supplies for Better and More Profitable Metal Finishing*

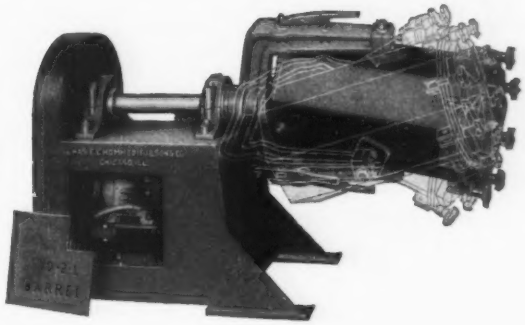
### No. 18 — VARIABLE SPEED POLISHING LATHE

Independent spindles—each with separate patented Variable Speed Drive and controls — ball-bearing throughout. Powered by two up to 15 H.P. motors. Adopted by leading manufacturers as standard equipment.

### TYPE L — DOUBLE ACTION BARREL For ABRASIVE TUMBLING or BALL BURNISHING

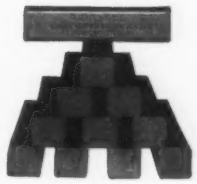
The cylinder can be operated at an angle for producing a double tumbling action—thus producing a better and more uniform finish in a much shorter time.

Longer pieces finished more uniformly and without bending.



**DURABILITY**
**PRODUCTION**
**ECONOMY**
**EFFICIENCY**

RELIANCE NUWAY BUFFS FOR FAST CUTTING



RELIANCE EXTRUDED COMPOSITIONS
STANDARD SIZE 2 x 2 x 10"

**THEY CUT**
**THEY CLEAN**
**THEY COLOR**

***THE ANSWER TO INCREASED PRODUCTION AT LOWER COSTS***

# Chas. F. L'Hommedieu & Sons Co.

**MANUFACTURERS OF METAL FINISHING EQUIPMENT AND SUPPLIES**

*GENERAL OFFICE AND FACTORY*

**4521 OGDEN AVE. CHICAGO 23, ILL.**

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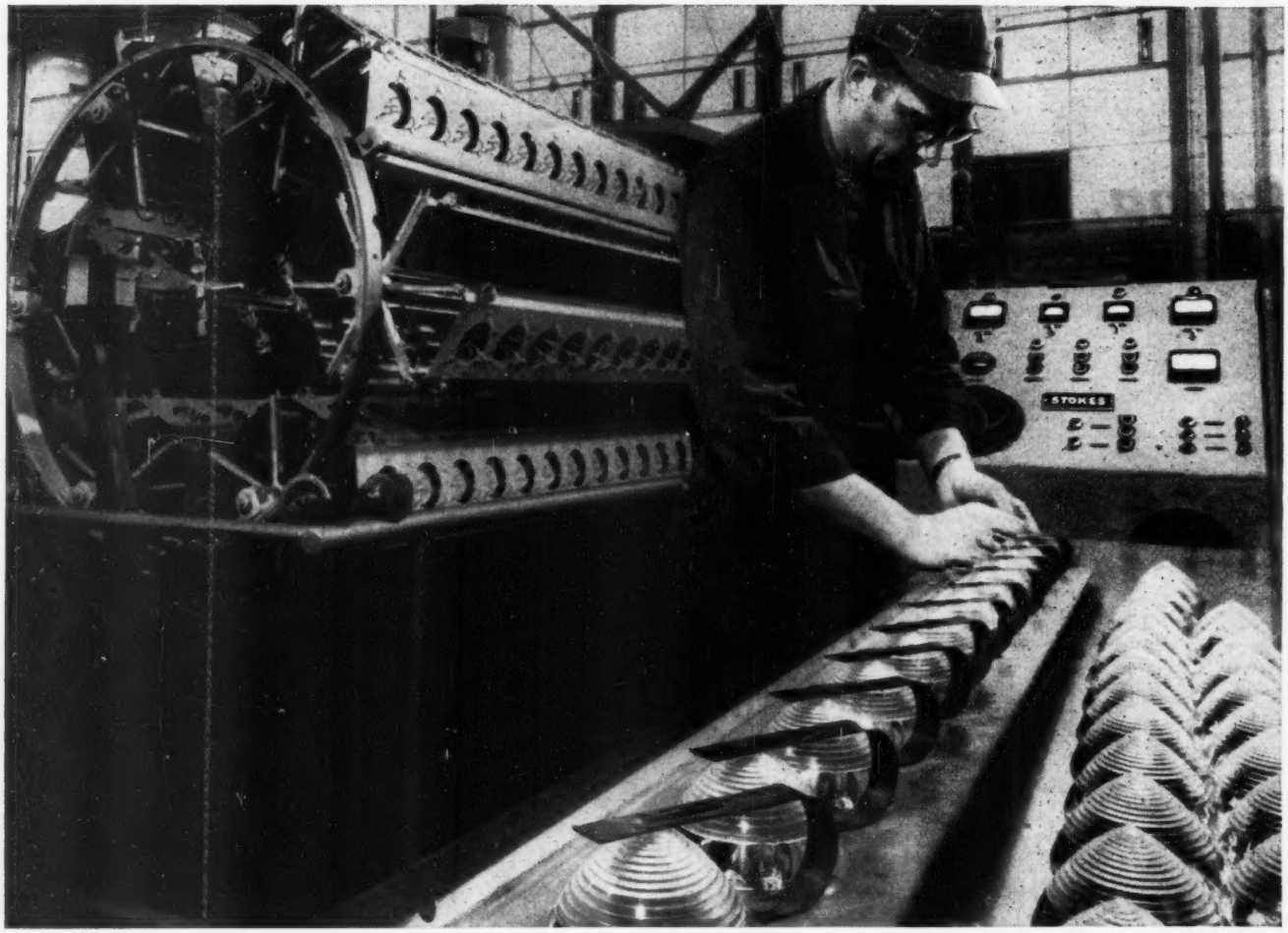
**Branches:**
**Cleveland & Los Angeles**

RELIANCE




# There's low-cost vacuum plating in FORD'S future . . .

Back-up light lenses, heater opening covers and medallions are products of the Parts and Equipment Manufacturing Division of FORD Motor Company. A Stokes Vacuum Metallizer is used to give these parts a bright, lasting trim.

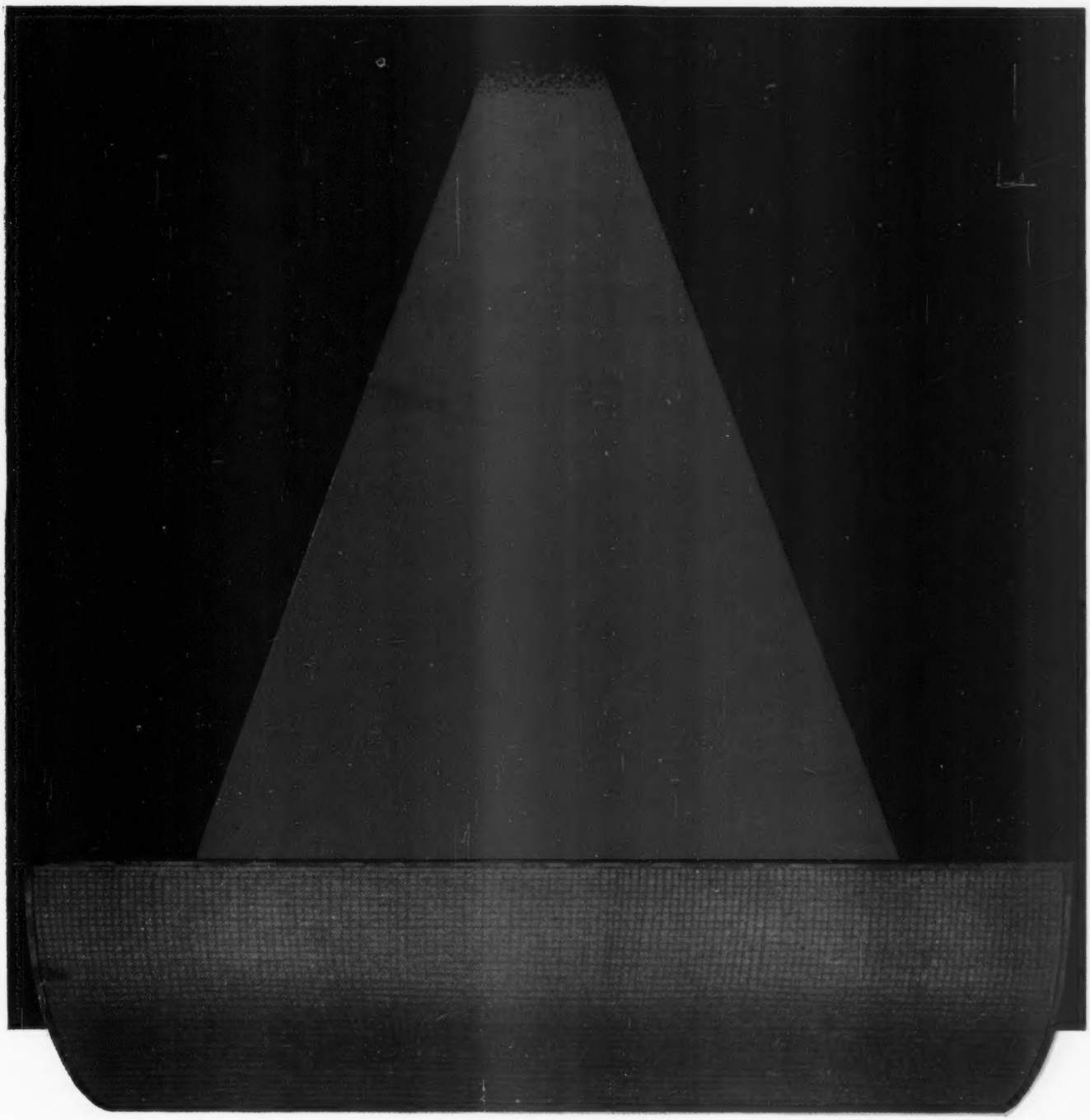
Vacuum plating . . . often known as vacuum metallizing . . . can impart distinctive gold, brass, copper, or chrome finishes to a variety of parts at less cost than conventional plating. It makes it possible to coat non-conductive materials. Bright, lasting finishes can be given to parts that must withstand weathering.

The Stokes Model 426 Vacuum Metallizer, as used at FORD, handles around 430 three-inch diameter parts per batch—can deliver efficiently and economically on large or small parts. Interlocked centralized controls make it easy for men to learn the routine—to produce quality components with minimum attention. The equipment is compact and self-contained—takes little floor space.

Investigate Stokes Vacuum Metallizing equipment now—find out how low-cost metallizing can play an important role in your future. Contact your nearest Stokes office, or write for additional data on Stokes Vacuum Metallizing equipment.

*Vacuum Equipment Division*
F. J. STOKES CORPORATION
5500 Tabor Road, Philadelphia 20, Pa.

**STOKES**



# the Mutual red carpet is out for every customer

If you use chromium chemicals, specify *Mutual.* At Mutual your order gets V.I.P. treatment from mail room to shipping room—not only when supplies are plentiful, but also when they're not.

Quality? High, uniform, the standard of industry for over fifty years. Expert technical service rounds out the picture.

**Chromic Acid • Sodium Bichromate • Potassium Bichromate**

MUTUAL

## Mutual Chromium Chemicals

**SOLVAY PROCESS DIVISION • 61 BROADWAY, NEW YORK 6, N. Y.**

Allied Chemical

UNICHROME
Trade Mark

*News about*
# COATINGS for METALS
*Metallic.....Organic.....Decorative.....Protective*

# New production barrel provides savings in chromium plating small parts

## *Self-regulation in chromium baths proves vitally important*

Solution control once was a major headache in chromium plating. Lengthy chemical analyses had to be made continually and still are, except where Unichrome SRHS® Chromium Solutions are in use.

SRHS baths have *built-in* regulation. Control calls merely for a quick hydrometer reading which tells when to add more salts. Important chemical ingredients are automatically maintained in optimum plating balance. Only a solution which gives this *automated* operation assures the maximum in plating speed, coverage, cathode efficiency, and plating range.

### BRONZE PLATING PROVES ITSELF A PRACTICAL PRODUCTION PROCESS

Platers have found M&T *Golden-Glow* Bronze as simple to operate and control as processes which deposit a single metal. It is now working in hundreds of installations, some as large as 30,000 gallons.

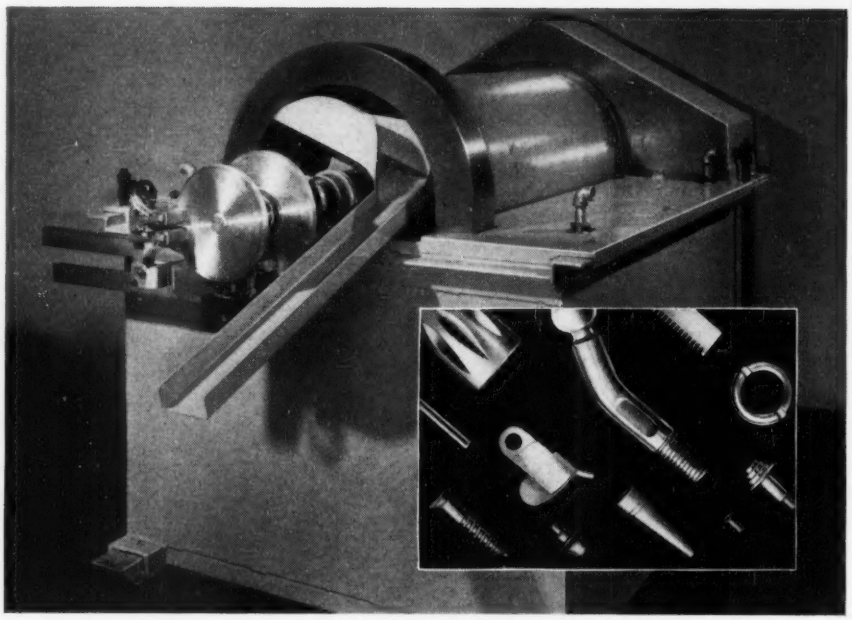
This copper-tin plating process deposits bronze at twice the speed of the fastest coppers. Coverage is uniform even on work requiring the deepest "throw". As a decorative plate that simulates 24K gold, its overall cost matches copper, beats brass. As an undercoat, it buffs more readily and offers corrosion resistance superior to copper, thus reducing dependence on nickel for corrosion resistance.

Write for more facts, or talk to an M&T engineer about it.

*Unichrome is a trademark of Metal & Thermit Corp.*

**METAL & THERMIT**
**CORPORATION**

General Offices: Rahway, New Jersey
Pittsburgh • Atlanta • Detroit
East Chicago • Los Angeles
In Canada: Metal & Thermit—United Chromium of Canada, Limited, Rexdale, Ont.



Occupying 110x54 inches of space overall, this new Unichrome **Continuous** Chromium Plating Barrel features a 4-foot plating cylinder 24 inches in diameter, and 500 gallon tank.

Chromium plating of small parts is no longer a costly operation. A Unichrome Continuous Chromium Plating Barrel enables platers to turn out large volumes of small pieces with a minimum of supervision.

This new development of Metal & Thermit permits small parts plating to be automated; puts it on a production line basis.

### A REAL PRODUCTION TOOL

In productive capacity, the new barrel is equivalent to 3 or 4 batch-type barrels. It enables plating time to be varied via a variable speed drive. It will plate up to 200 pounds of parts per hour with high quality decorative chromium that shows no contact marks or "misses".

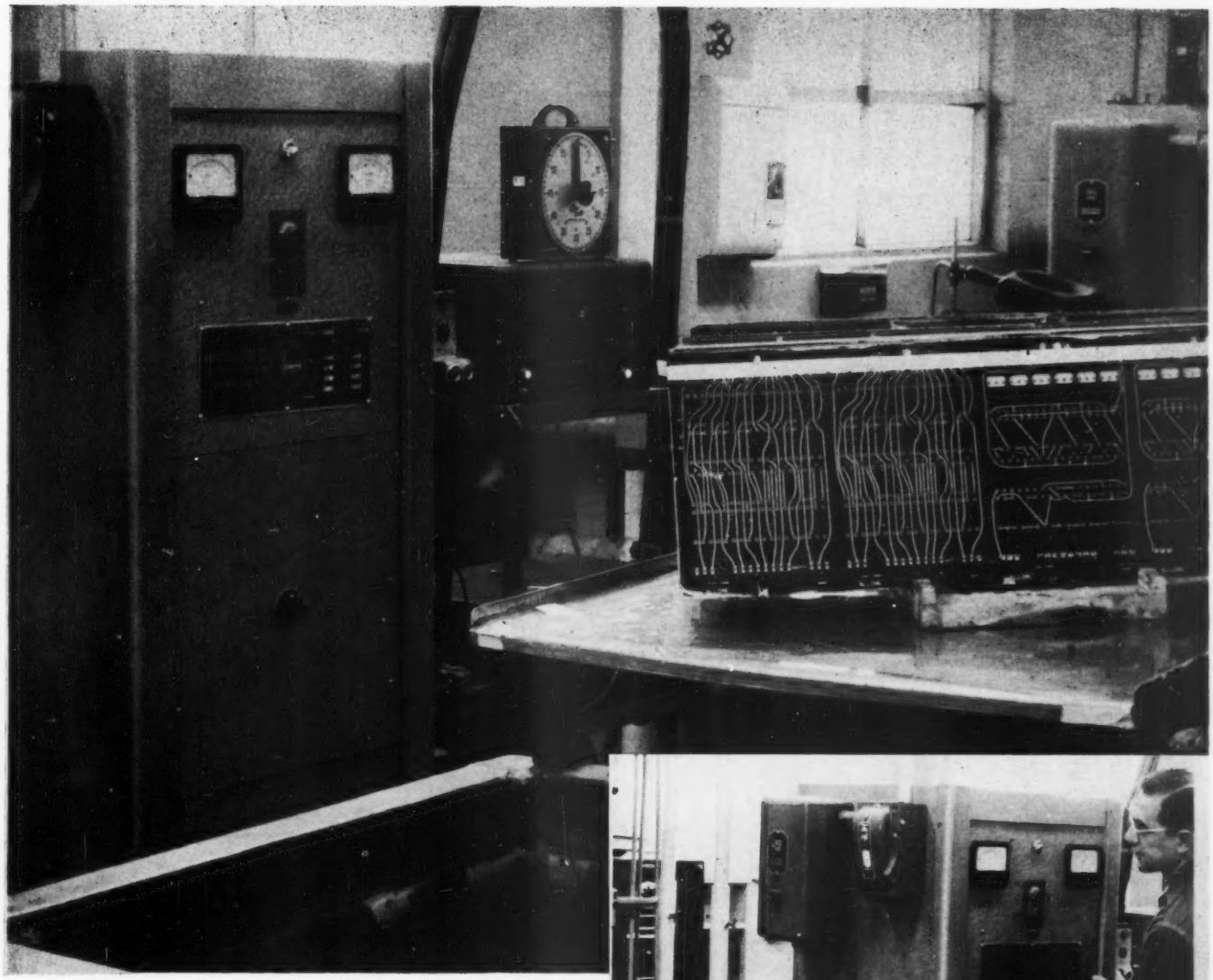
### ADVANCED MECHANICAL DESIGN

The Unichrome Chromium Plating Barrel has a unique, discontinuous spiral feed, and a loading chute to accept parts from the customer's feeding mechanisms. Other features: Solution circulating pump; heat transfer coils; anode and electrical contacts rated for 3000 ampere, 12 volt service.

### ANOTHER COST-CUTTER: NEW IMMERSION HEATER

An advanced type of electric immersion heater developed by M&T uses an acidproof tantalum tube to protect the heating element, promote good heat transfer. This tantalum sheath eliminates cracking such as may be encountered with brittle quartz heaters. Thermostatically controlled, the unit is rated at 5KW, develops 17,000 Btu/hr – enough heat to raise 100 gallons of water 20°F per hour.

Send for data on above equipment.



## I B M installs Automatic current controlled* units at Poughkeepsie plant.

IBM's Poughkeepsie, New York, plant is now achieving more uniform plating on Printed Wiring Boards since installing RAPID ELECTRIC constant current* rectifiers

Automatic control of current density relieves the operator from making constant adjustments as panels are loaded and unloaded from the plating tanks. *One setting* permits closer plating tolerances, while achieving greater control of hole sizes on through-hole plating.

At Poughkeepsie, RAPID constant current rectifiers are used on copper and tin-lead Printed Wiring Boards for IBM Card Punch, Electronic Calculator, and Data Transceiver equipment. With Automatic current density control IBM has eliminated the danger of burning due to over current and over plating. Time lost in estimating current settings for corresponding plating areas is non-existent.

RAPID rectifiers can be designed to bring *YOU* Automation plating. Why not write for further details? Our field engineering staff will be pleased to visit your plant for proper evaluation of your needs.

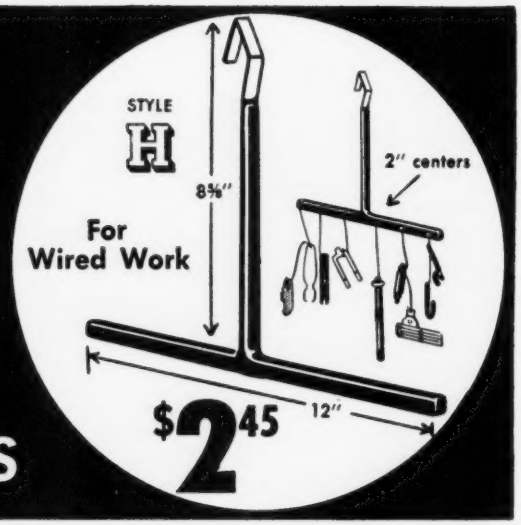
THE NAME THAT MEANS:

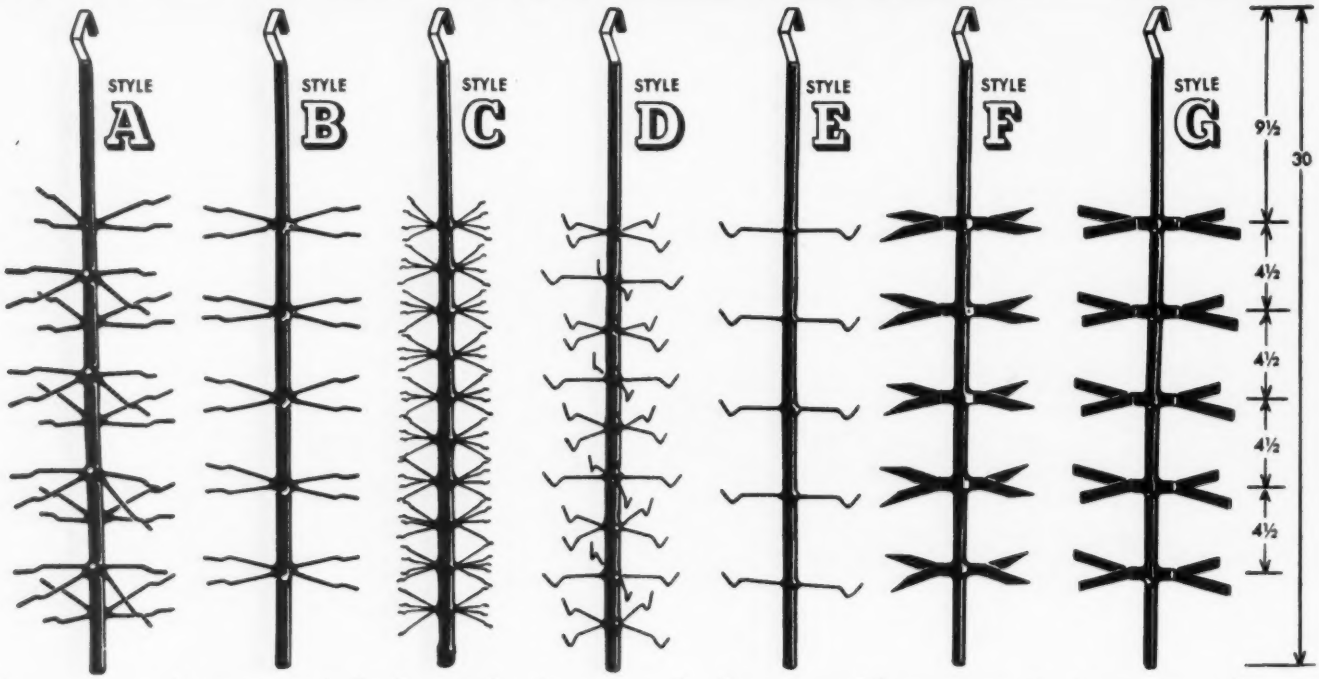
*"More Power to You!"*

**RAPID ELECTRIC CO.**

2881 MIDDLETOWN ROAD NEW YORK 61, N. Y. TALMADGE 8-2200

# *New,* Ready Made Mass-produced *Economy* Plating Racks




| Style A | Style B | Style C | Style D | Style E | Style F | Style G |
|---|---|---|---|---|---|---|
| Tips .114 dia. phosphor bronze | Tips .114 dia. phosphor bronze | Tips 1/16" dia. phosphor bronze | Tips 3/32" dia. phosphor bronze | Tips 3/32" dia. phosphor bronze | Tips 1/16x1/2" phosphor bronze | Tips 1/16x1/2" phosphor bronze |
| $5.78 | $4.77 | $6.00 | $5.83 | $4.42 | $5.84 | $5.69 |

***Add $1.50 packing charge on orders for less than 12 racks.***

## *Made of BEST materials obtainable*

**SPINES** are one-piece solid copper, round cornered and sand-blasted for perfect adhesion of the insulation.

**RIGID CONSTRUCTION.** The phosphor bronze tips are riveted to the spine, then soldered where necessary for complete rigidity. **Do not confuse with Thinker Boy construction—the tips are not replaceable.**

**COATED AFTER ASSEMBLY** with the same Universal Plastic used on BELKE Custom-Built and Thinker Boy Racks—withstand all cleaning and plating cycles.

The low prices are made possible through economies of mass production. No specifications can be changed at these prices except in mass production quantities. Prices subject to change with changes in costs.

## Place your order early

**Economy Racks will be stocked for immediate shipment as soon as production catches up with the demand. In the meantime please order in advance of your requirements and avoid disappointment.**

**Belke Manufacturing Company**
947 N. Cicero Ave., Chicago 51
EVERYTHING FOR PLATING PLANTS

# "Dave, that Dow Methylene Chloride sure cured our stripping problems with masking lacquer"

"It sure did, Jess. It takes minutes to do jobs that other cleaning and stripping compounds take *hours* to do."

**"Wonder why?"**

"Two reasons. One is high solvent power. Dow Methylene Chloride penetrates coatings faster. The other is that it immediately starts an evenly distributed lifting action that really loosens things up."

**"Would it strip those new parts we got in last week?"**

"Probably would. They use Dow Methylene Chloride for all sorts of formulations to strip paint, varnish, lacquers and epoxy resins. Good vapor degreasant, too. Sometimes it's possible to use methylene chloride in a common vapor degreaser."

**"Is it safe, Dave?"**

"It's nonflammable and carries a low toxicity rating—the MAC is 500 ppm. Very stable, too!"

**"Sounds better all the time. Tell me more."**

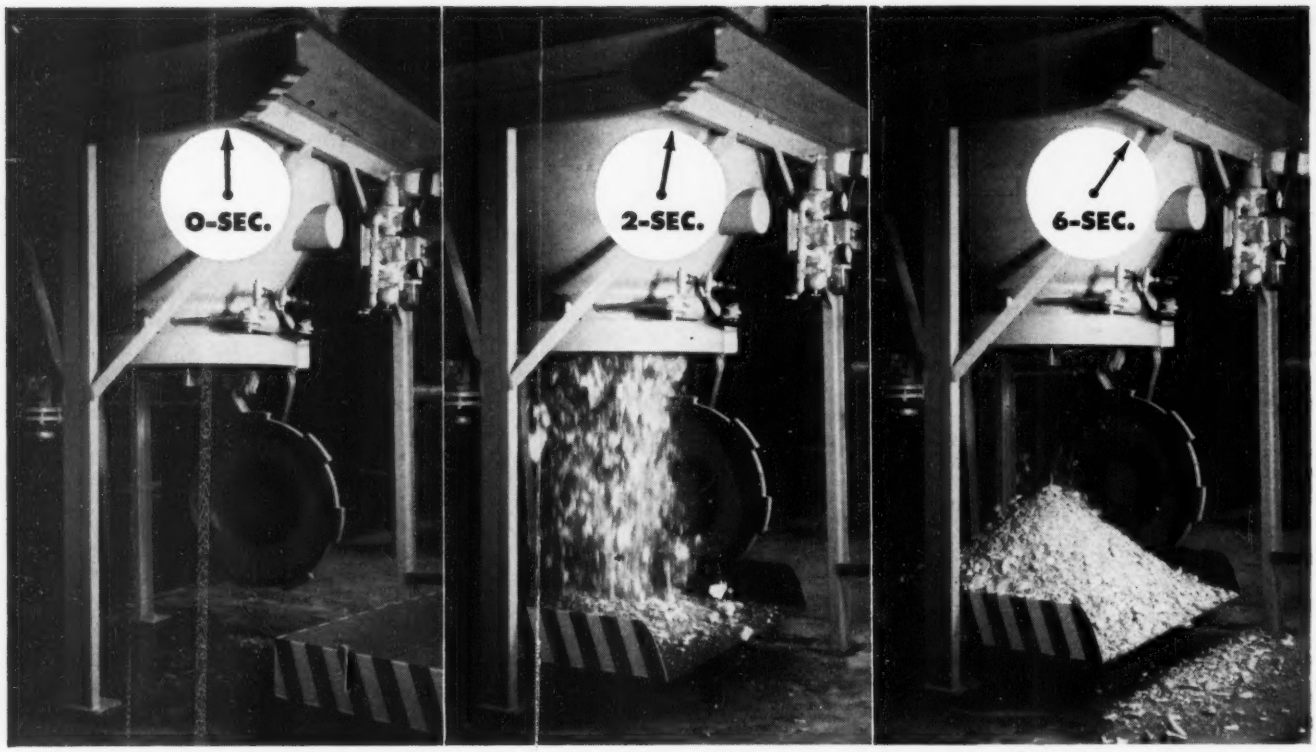
"That's all I know, but the Dow people can answer all your questions. Why don't you write them a note?"

**"Who?"**

"You know, they make Dow Perchloroethylene Industrial and Dow Trichloroethylene for vapor degreasing, and Chlorothene® for cold cleaning. THE DOW CHEMICAL COMPANY, Midland, Michigan."

YOU CAN DEPEND ON DOW

# Here's what MODERN FILTERS can do!




## Just flip the lid . . . WHAM . . . cake removed in seconds

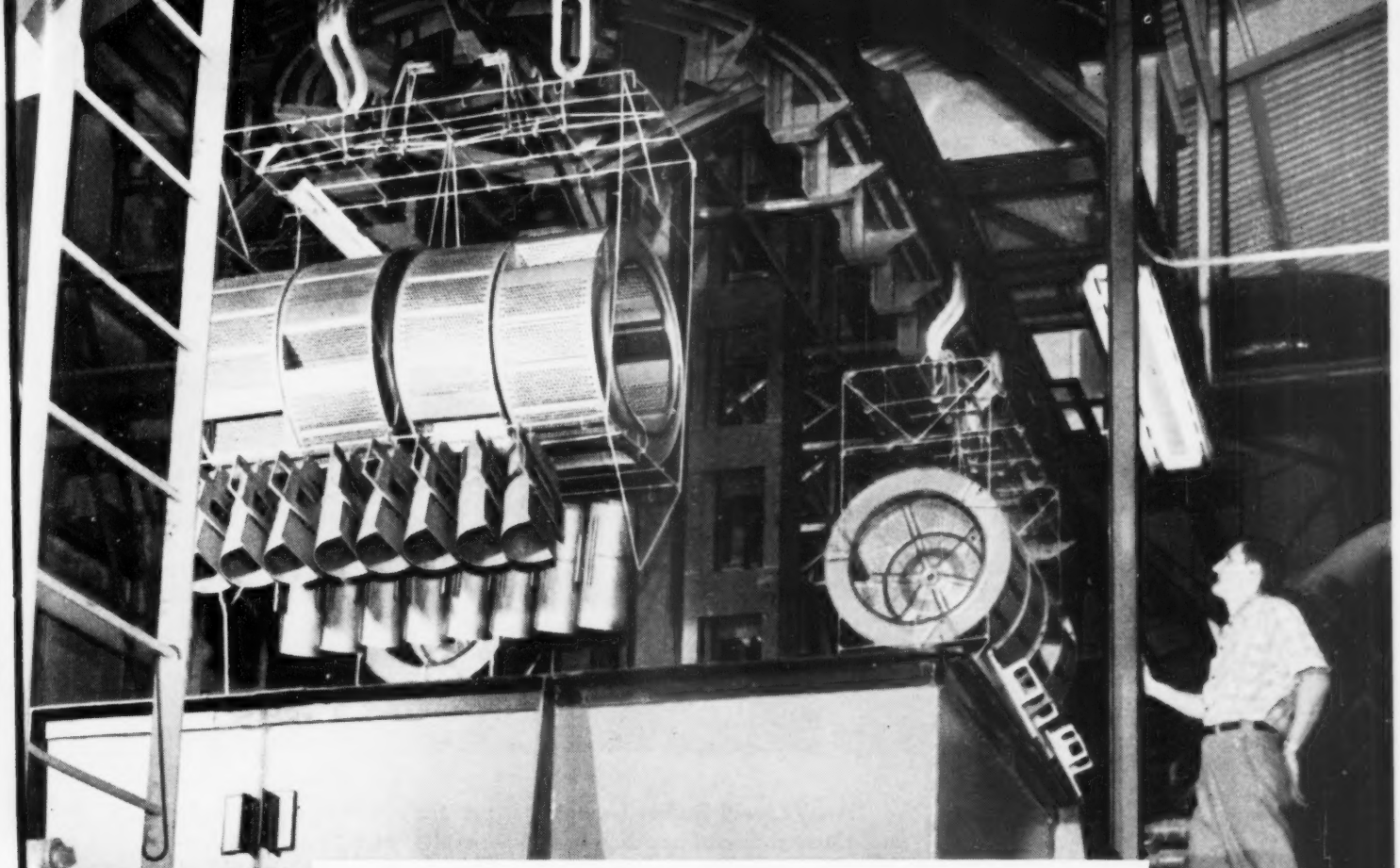
It's just as easy as that . . . why put up with costly downtime and messy cleaning operations when Industrial has the answer to **rapid thorough cleaning in seconds.** Industrial's new Vertical, Bottom Outlet, Type "152" Filter offers tremendous advantages in removing and subsequent disposing of waste materials.

Industrial's quick opening bottom drop door is the **fastest available method for removing large volumes of solids in a dry form or slurry,** depending on the customer's wishes. Shaken loose by a vibrator, the solids literally explode from the leaves, fall into a tote box ready for simple disposal. The cake can be leached before removal from the filter to recover valuable metal salts. **This is especially important in reducing costs** not only in the plating room but helps cut the cost of preparing end waste for safe disposal.

***NEW! 16 page manual describes modern filtration methods for plating . . . ask for Bulletin EP-100***

**INDUSTRIAL**

**INDUSTRIAL FILTER & PUMP MFG. CO.**
5906 **OGDEN AVENUE** • **CHICAGO 50, ILLINOIS**



## UDYLITE MACHINE PROCESSES WASHER-DRYERS AT WHIRLPOOL FOR PERFECT PORCELAIN

This Udylite Full Automatic operating in the St. Joseph, Michigan plant of the Whirlpool Corporation plays an important part in giving perfect porcelain finishes to the Whirlpool Washer-Dryers. It processes the parts through a 17 station cleaning and pickling cycle prior to porcelain coating. Since June 1, 1956, this Udylite machine has operated constantly 16 to 24 hours per day.

Nowhere is the fine porcelain finish more dependent on precision than in this cleaning, pickling and nickel immersion cycle of the Udylite engineered machine. It guards against the rust and scale of under treatment as well as the spotting out of over treatment.

Every step of the cycle is so precisely timed by the Udylite machine that each part gets the same exact treatment prescribed by Whirlpool engineers based on their long experience in quality production.

It will pay you well to add Udylite experience to your knowledge and requirements for the right answer to unusual metal processing problems. Write us today.

THE Udylite CORPORATION
DETROIT 11, MICHIGAN

WORLD'S LARGEST PLATING SUPPLIER

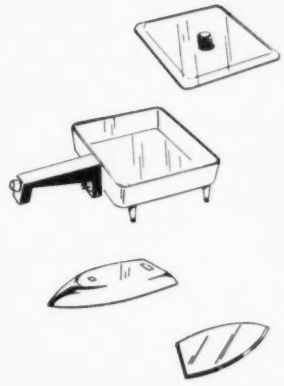
MIGHTY COOL WAY TO
CUT OR COLOR METALS...
WITH AHCO
LIQUID BUFFING COMPOUNDS
Ahco Liquid Buffing Compounds are made with the same high-grade abrasives as Ahco bar compounds, but with an emulsion-type liquid binder. These versatile compounds may be applied in several ways: the work or the buff may be sprayed, or the work may be dipped or brushed before buffing. The amount of compound applied to a wheel or buff can be more easily controlled; buffs run cooler — thus eliminating a fire hazard and lengthening buff life. Work surfaces clean more easily; there are no nubbins left over, so you save compound. AHCO Liquid Compounds are especially suitable for automatic buffing
AHCO
APOTHECARIES HALL CO.
DIVISION
HUBBARD-HALL CHEMICAL CO.
WATERBURY · CONNECTICUT

**STAMPINGS • EXTRUSIONS • BRASS GOODS**

## Finish them *UNIFORMLY* at a FRACTION of FORMER COSTS!

Hammond

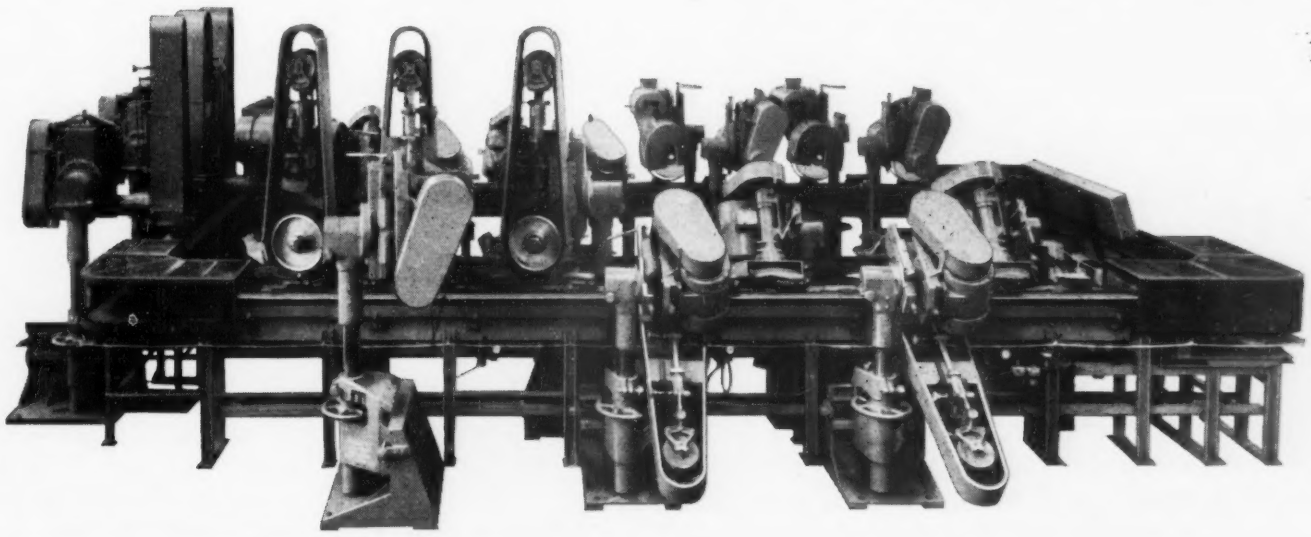
**STRAIT-LINE AUTOMATICS**

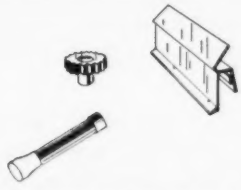


- Reversing Conveyors
- Horizontal return type
- Open center type shown below
- Over and under chain driven type

Hammond conveyors are of machine tool construction and designed for "round-the-clock" production.

***Send us prints and production requirements of your job.***





**SEND SAMPLES**

**Send us one finished and several rough samples. You will receive a complete engineering report. No obligation.**

If your job calls for Rotary Automatics we can offer:

- 21" turret with 3 finishing heads
- 34" turret with 4 finishing heads
- 46" turret with 5 finishing heads
- 62" turret with 6 finishing heads

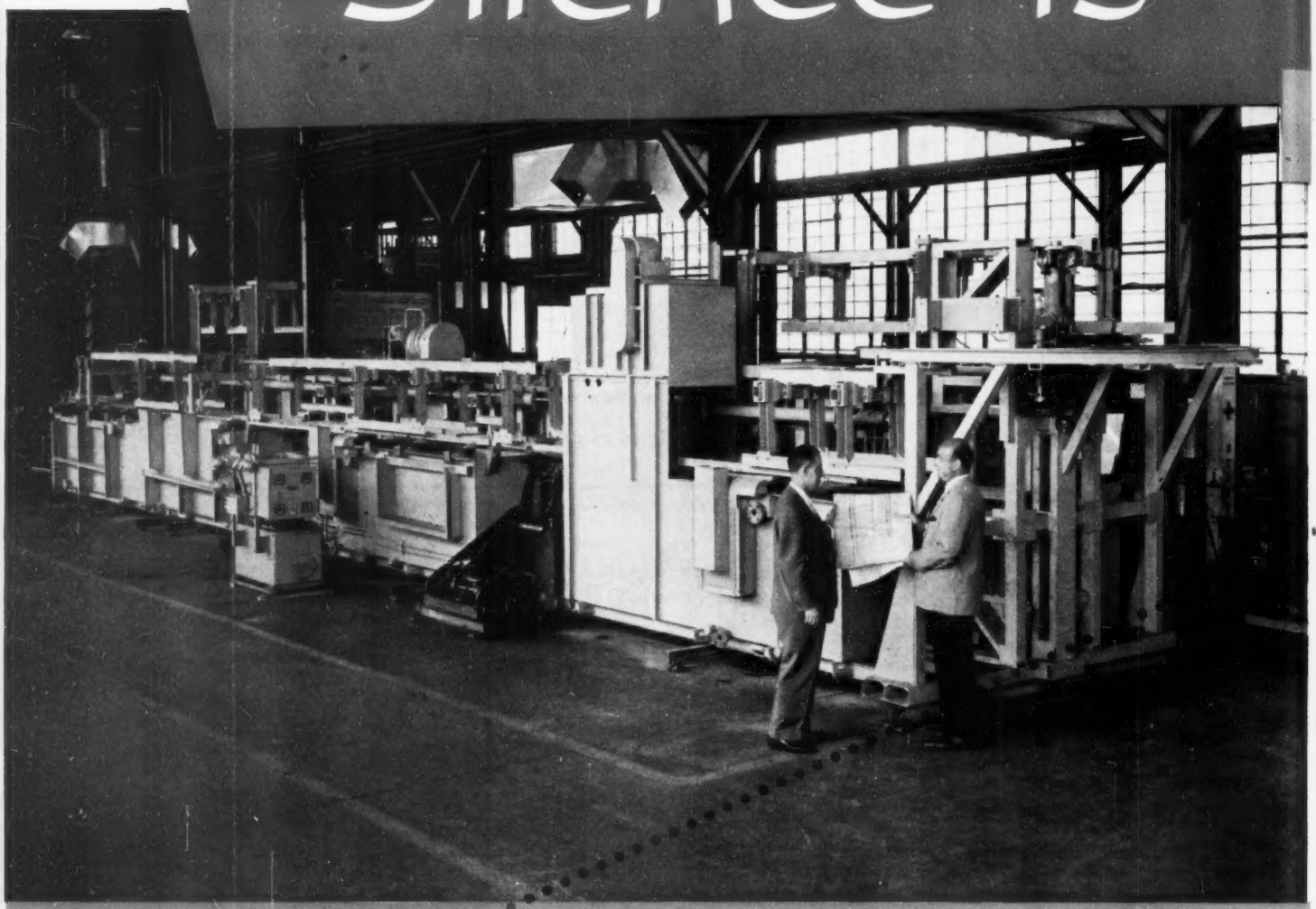
Also, continuous table Rotary Automatics — Junior Automatics — Flat Finishers — Polishing and Buffing Lathes

***America's widest line of Polishing, Buffing and Deburring machinery.***

Hammond Machinery Builders INC.

1601 DOUGLAS AVENUE • KALAMAZOO, MICHIGAN

# Silence is



This new Wagner Automatic meets headroom restriction admirably. Height over all 9'10", clearance 1⅝".

Yes, the silent operation of this Wagner Automatic Plating Machine means money in your pocket, for silence in any fine piece of machinery indicates a complete absence of vibration or impact. The quiet, smooth operation of the new Wagner Automatic prevents jarring of plating racks and loss of parts, reduces wear, repairs and costly downtime.

Here's how Wagner gives you advantages not offered by any other automatic plating equipment:

1. **EFFICIENCY** — Every Wagner Automatic is a custom machine designed for a specific cycle but uses standard components and assemblies. They are not standard machines resulting from a series of compromises.

2. **CAPACITY** — The Wagner Automatic provides greater load capacity per dollar invested. Deeper tanks are practical with low headroom, hence greater capacity per square foot of plant area. Our automatic loader may be installed to integrate the machine with conveyors to and from other processes, reducing handling to a minimum.

3. **ECONOMY** — Standard components are used

**MANUFACTURERS AND PROCESSORS OF ALL METAL-FINISHING**

*Chicago* *Indianapolis* *Cincinnati* *Rochester*

**400 MIDLAND AVE.,**

# Truly Golden!

## IN THE WAGNER AUTOMATIC

throughout, so parts are easily available. Wagner modular assemblies contribute to fast, low cost installation and replacements. Adjustments are easily made by untrained personnel with simple tools.

4. **SAFETY** — Wagner Automatics have "built-in intelligence" which prevents damage. Completely automatic stops throw the power switches the instant a jam or trouble develops. No crack-ups, no destroyed parts, no loss of metal.

5. **SMOOTHNESS** — Hydromotors actuate both vertical and horizontal transfer. Vertical work lift arms are raised by rack and pinion mechanisms, guided by hardened rollers. The horizontal transfer carriage rolls effortlessly on stainless steel balls. All mechanisms are easily reached for lubrication or central lubrication may be installed. There are no dogs, cams or conveyor hooks to create jarring impact.

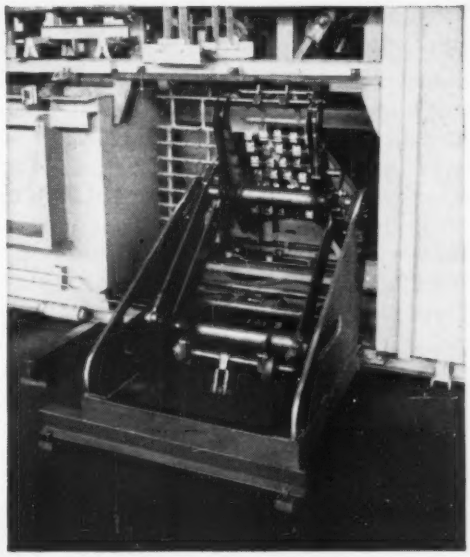
6. **CLEANLINESS** — There are no moving parts or hydraulic connections above tanks, consequently you don't have to battle contamination of solutions by dripping fluids and lubricants. Corrosion and gumming of mechanisms is eliminated as moving parts are not directly above source of fumes.

7. **ENGINEERING** — Wagner engineers analyze your problem, design your complete finishing system and take full charge of installation of Wagner automatics, rectifiers or other equipment required. Expert service after installation is immediately available when requested.

If you have a plating problem, whether it is an automatic or still tank operation, consult the Wagner man in your area. Remember, only Wagner manufactures the equipment and processes the chemicals required by your plating plant. You can get all the answers from one source, and service beyond compare. Call, write or wire.

### WAGNER MATERIALS HANDLING ENGINEERING SERVICE . . .

In addition to engineering and installation of complete plating systems, we assume responsibility for design and construction of equipment for handling parts plated or to be plated, integrating with your automated processes. The Wagner "Flipper" shown was engineered for the job but is adaptable to other parts handling problems. It removes loaded racks after plating and deposits entire load on belt conveyor. Most Wagner machines also include our automatic loader which transfers loaded racks from chain conveyor to plating machine.



CHEMICALS, ANODES, AND EQUIPMENT

*Cleveland* *Grand Rapids*

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Wagner BROTHERS INC.

# Quality

## is consistent when you polish and buff

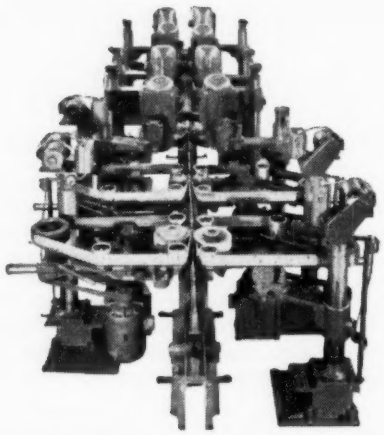
## the *Acme* way!

Acme can build you a polishing and buffing machine to turn out part after part on schedule, and always with the same high quality of finish. That's why so many manufacturers turn to Acme to solve the tough ones.

Unusual contours or surface conditions won't stop Acme's specialized engineering talent—they'll build an automatic operation to handle it faster and cheaper. Maybe lack of space is your problem—Acme engineers working with flexible Acme standard units can often add to the number of operations on a single machine and eliminate the need for additional machines on the line. Or perhaps redesigning the indexing cycle to add more polishing or buffing heads on an existing machine can speed up production. Whatever your polishing and buffing problem is, the Acme man can help you.

**LET ACME *Polish Off* YOUR FINISHING PROBLEMS**

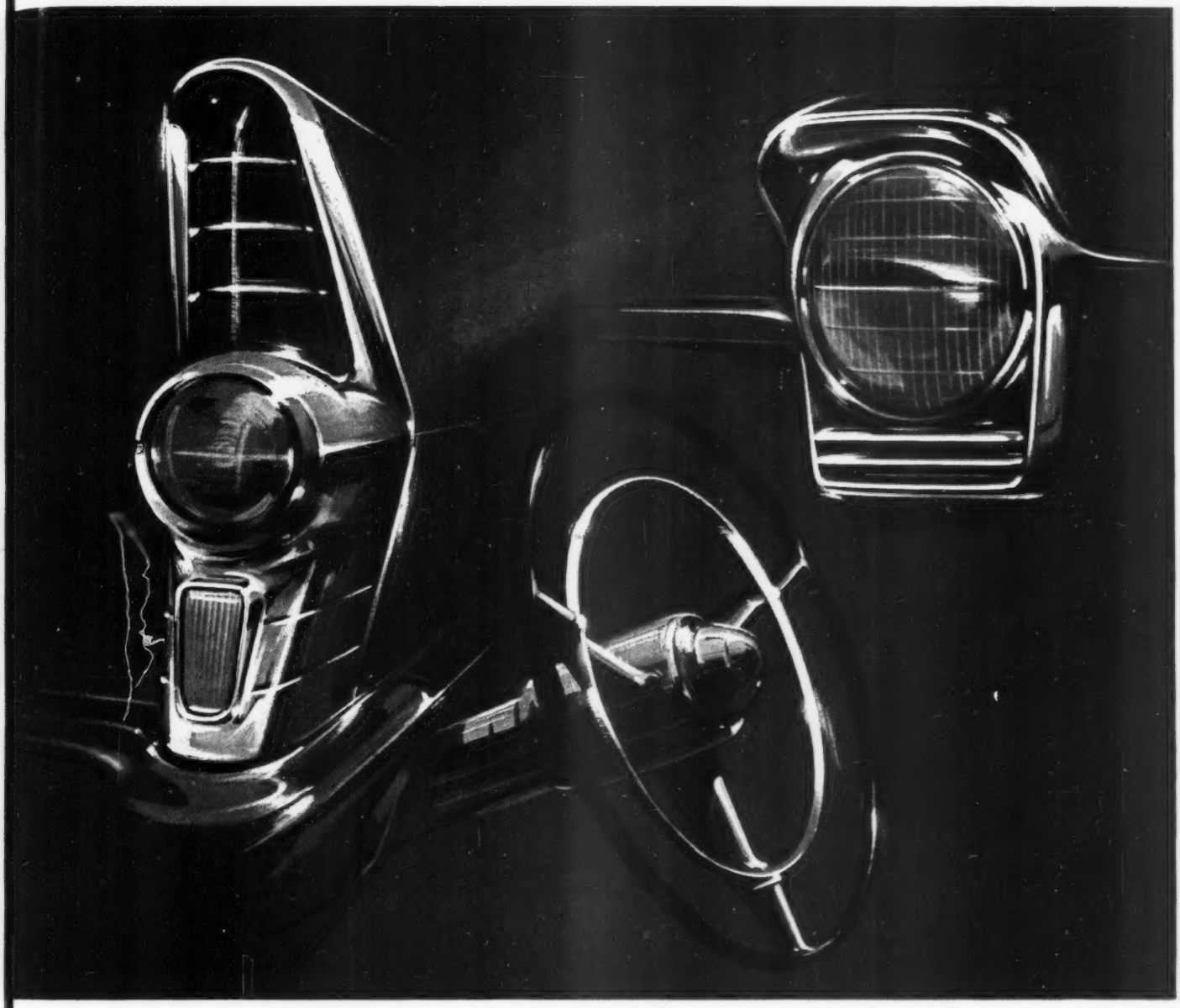
Want proof? Send us your polishing and buffing problem and we'll give you our recommended solution in an Acme automatic machine.

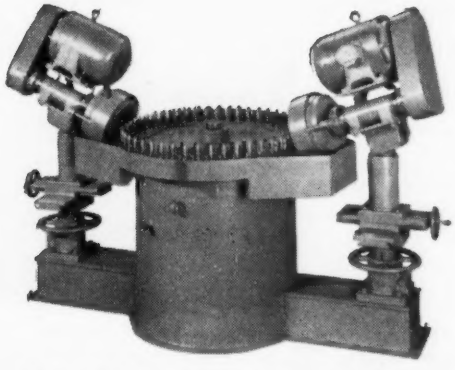


**This Acme automatic straight-line machine with individual fixtures completely polishes and buffs upwards of 1,400 pieces per hour. Four Acme G-3 belt polishing heads with floating back-up wheel and vertical oscillation are followed up by eight Acme G-3 adjustable floating head buffing lathes.**

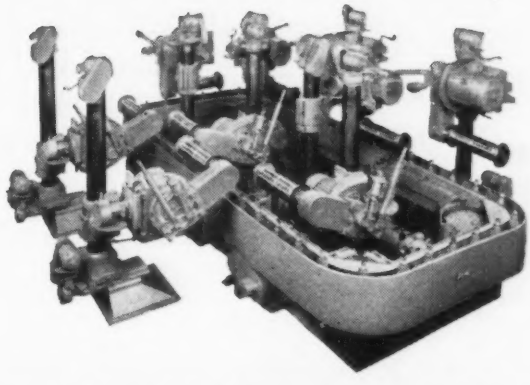
**ACME MANUFACTURING COMPANY**

LEADING PRODUCERS OF





Extremely high volume can be put through this setup, for spot face grinding valve rocker arms. This Acme 36-inch continuous rotary table, with grinding wheel heads having cup wheels, can be quickly adapted to a variety of small castings.



An Acme rectangular polishing and buffing machine with eight Acme heavy-duty adjustable floating head lathes having 25-HP motors, equipped with 24″ cartridge type spindles with remote control traverse feed on each head. Production can run several thousand pieces per hour.

**1400 E. 9 MILE ROAD, DETROIT 20, MICHIGAN**

AUTOMATIC POLISHING AND BUFFING EQUIPMENT SINCE 1910

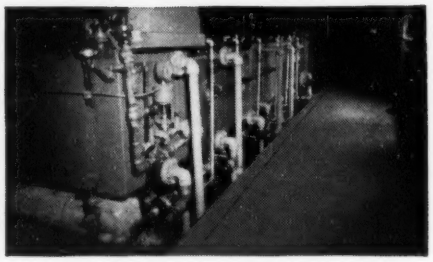
Completely automatic, unattended unloading end of the Stevens Automatic Barrel showing control panel and rectifier site located above machine.

# Unistrut says— "COSTS 50% LOWER— FINISH BETTER with . . . STEVENS AUTOMATIC BARREL MACHINE"

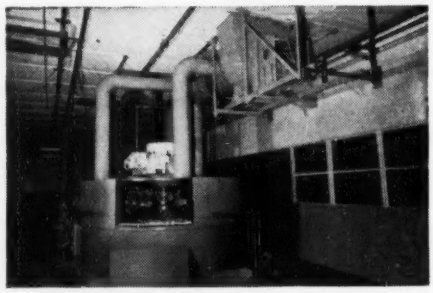
Every day in the Unistrut Corporation plant, Wayne, Michigan, thousands of small parts are zinc plated and shipped to Unistrut warehouses throughout the United States. All of these parts are zinc plated automatically by a Stevens Automatic Barrel Machine.

Unistrut high standards require a uniformity of plate on the parts used in their metal framing systems. But since installing the Stevens Automatic Barrel they have reported other advantages as well—"less handling, smaller inventories and quicker shipments." When you consider the 50% cost savings of actual plated parts too, it all adds up to a terrifically profitable investment.

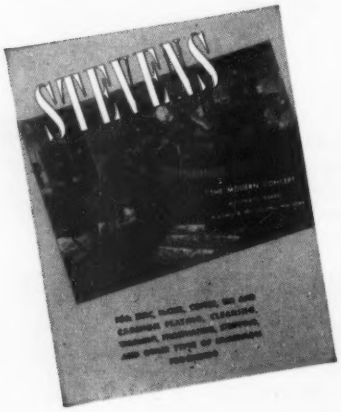
Why don't you tell us your metal finishing problems and let us make recommendations. There's no obligation.



Side view of machine showing excellent drainage system.



Plating section of machine with ventilating duct work.




Write today for your copy of the 1957 bulletin, "The Modern Concept . . . Stevens Automatic Barrel Processing and Plating Machine." Write to Frederic B. Stevens, Inc., 1800—18th Street, Detroit 16, Michigan.

STEVENS 75 YEARS OF SERVICE

FREDERIC B. STEVENS INCORPORATED
YOUR METAL FINISHING SUPERMARKET
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# For Positive–BUT SAFE

# Cold Degreasing

## Use SOLVAY METHYLENE CHLORIDE

### The Non-flammable, Low-toxicity Solvent

SOLVAY Methylene Chloride has an outstanding ability to dissolve greases, oils, tars, waxes and many other organic substances. This property, combined with non-flammability and low toxicity, makes it an ideal cold degreasing solvent for industrial use.

In many operations, satisfactory cleaning can be accomplished with SOLVAY Methylene Chloride alone. For more difficult operations, methylene chloride has found successful application as a rough cleaner for use prior to vapor degreasing. In this application it affords higher efficiency and reduces the production delays required for cleaning vapor degreasers.

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**Raise Solvent Flash Points With SOLVAY Methylene Chloride**

If you're using solvents with flash points below 80°C. (176°F.), meet safety standards for non-flammability easily and economically by adding low-cost SOLVAY Methylene Chloride.

For complete facts, check coupon for a copy of the article "Methylene Chloride for Raising Solvent Flash Points."

***Mail coupon for full data, sample!***

**SOLVAY PROCESS DIVISION**
ALLIED CHEMICAL & DYE CORPORATION
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Please send me at no cost the following material on SOLVAY Methylene Chloride:

- ☐ Data on cold degreasing solvent and cleaning before vapor degreasing.
- ☐ "Methylene Chloride for Raising Solvent Flash Points."
- ☐ Test sample.

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# Another Richardson Allen Engineering "First"

Demonstrating the same unsurpassed initiative, ingenuity and craftsmanship which, over the years, have set the pace of progress for the entire industry. Richardson-Allen engineers—working in close cooperation with Westinghouse engineers—have developed and perfected the ultimate in power rectification.

# SILICON

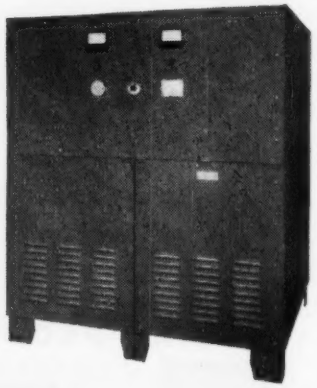
## DEPENDABLE POWER RECTIFIERS

**HERMETICALLY SEALED JUNCTIONS — HIGH TEMPERATURE OPERATIONS**

**VERSATILITY**—Richardson-Allen silicon rectifiers are now available for the plating and industrial fields in ratings up to 500 kws.

**EFFICIENCY**—Richardson-Allen silicon rectifier units are now supplying major industries with an unprecedented amount of direct current—with no loss in efficiency, no aging and no apparent limit to the life of the silicon junctions. Single silicon junctions are designed to withstand up to 300 piv.

**ECONOMY** — Occupying unbelievable small space, the initial cost is often lower than other conversion methods; practically no maintenance is ever needed and when installation savings and power savings are figured the total amount is impressive.



*For additional information, write to:*

**RICHARDSON ALLEN Corporation**

**DEPENDABLE RECTIFIER SPECIALISTS**

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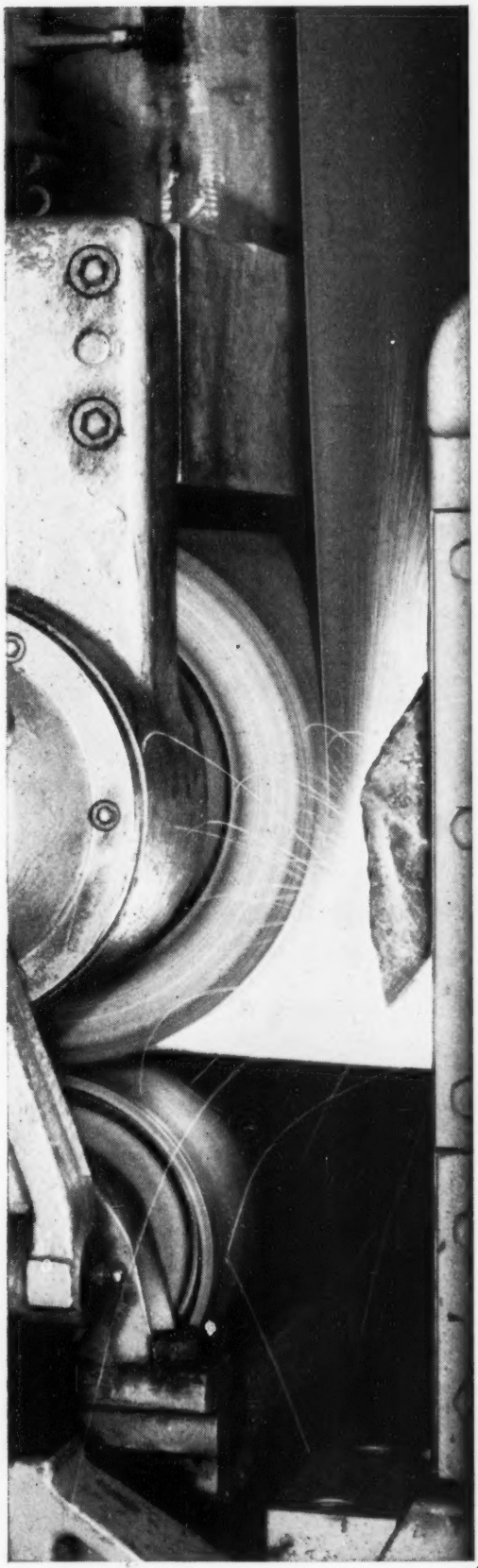
IN CANADA: Richardson-Allen of Canada, Ltd., 1236 Birchmount Rd., Scarborough, Ontario



# Flat Polish Faster Smoother... and Use Fewer Belts!

## Sharper Cutting, Cleaner Cutting Michigan Belts will do it for YOU!

If you're flat polishing you're after *surface*. And with Michigan Abrasive **RED COAT** brand belts you get the surface you want faster and with the same characteristics run after run.

Illustration shows the **RED COAT** belt spark pattern is concentrated close to the sheet . . . hot waste particles are thrown off—not carried by the belt. The fact that **RED COAT** belts resist loading is just one reason they cut sharper, longer . . . give you better results. You can *see* how sharper cutting Michigan belts mean savings in time and money. Just check the *perfect finishes* produced on sheets that had especially bad surfaces before a *single pass* through your machines. You have fewer rejects—spend less time in handling and second runs.

Like all Michigan belts, sheets and discs, **RED COAT** flat polishing belts produce the results users want. They produce them faster, longer and at less cost. The right coated abrasive you need for any job is listed in our big free catalog! Send for it today and call your Michigan representative the next time you order any coated abrasives. You'll enjoy using the best . . . Michigan

**MICHIGAN ABRASIVE CO.**

*Manufacturers of "The Humidity-Controlled Abrasive"*

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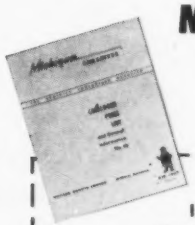

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I want more information on Michigan Abrasives!

☐ Send your Catalog ☐ Have representative call.

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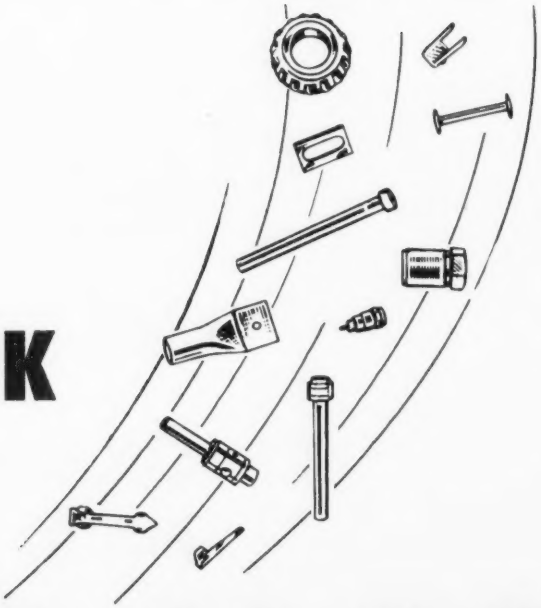
RED COAT BRAND

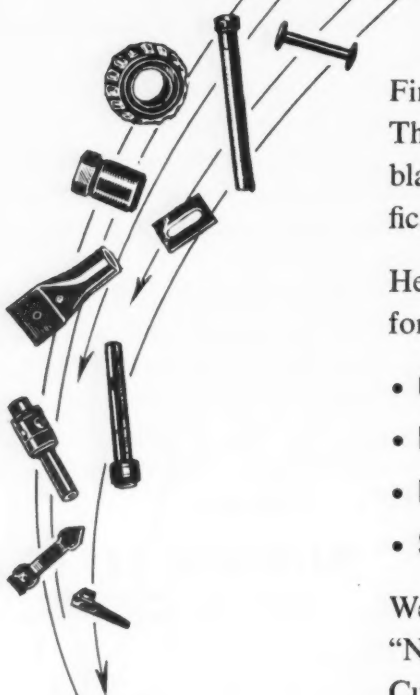
*Michigan*® **ABRASIVES**

*keep your production in the* **BLACK** *with*



# BLACK MAGIC

**as illustrated by the rehabilitation of small tools***



Final inspection is the measure of successful production. That's why it is important to use BLACK MAGIC as the black oxide finish. It meets or surpasses government specifications and all other black oxide specifications.

Here are a few of the advantages of using BLACK MAGIC for tool maintenance.

- **Corrosion reduction**
- **Less chip adherence**
- **New tool appearance**
- **Sharper grinding**
- **Reflection reduction**
- **Improves cutting qualities**
- **Longer service life**
- **Reduces grinding time**

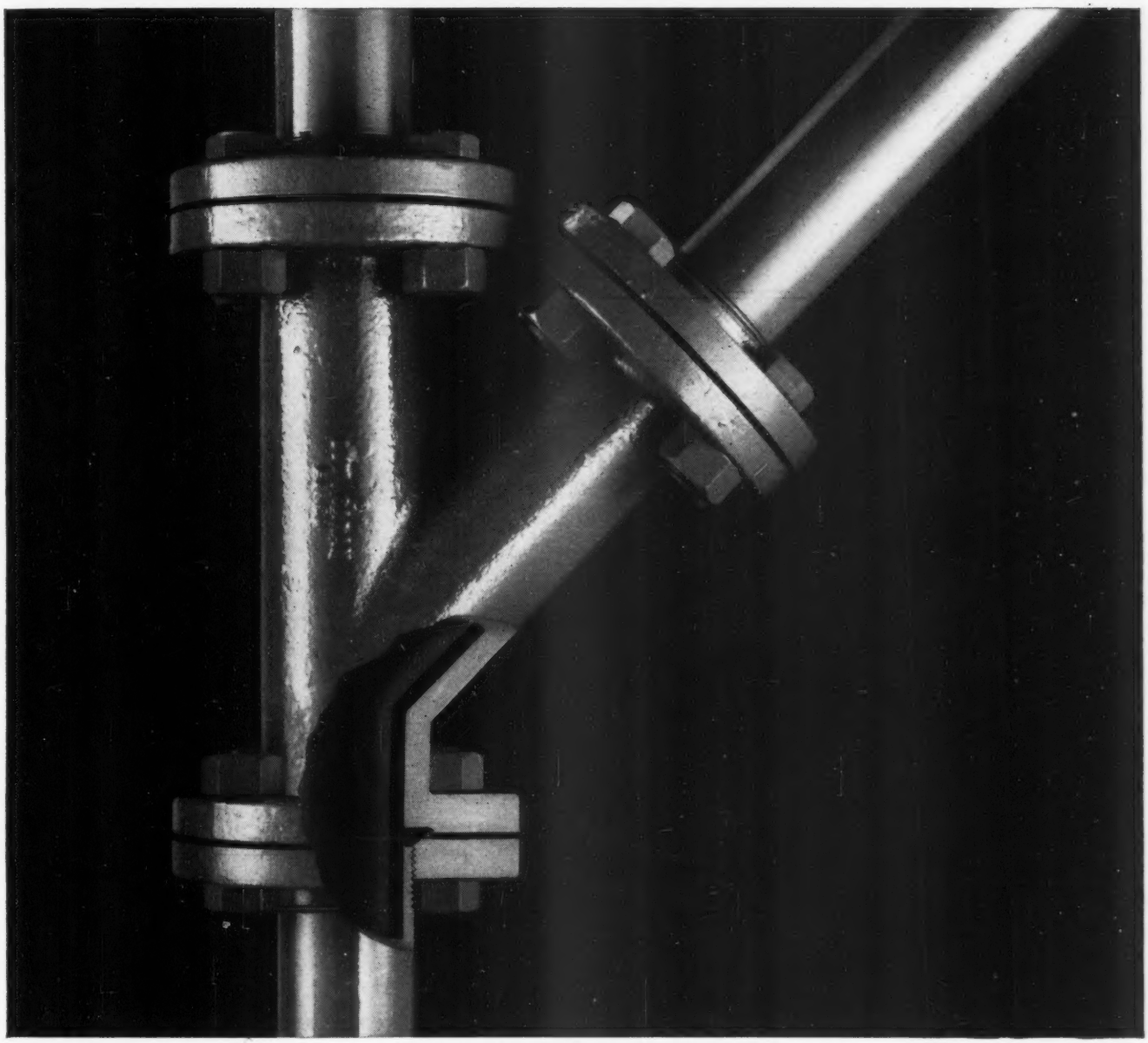
We would like to send you a reprint of an article entitled "New Life for Small Tools — Rehabilitation Treatment Cuts Resharpening 50%". It tells how manufacturers are saving thousands of dollars on tool maintenance.

* BLACK MAGIC PROCESS U. S. PATENT #2,355,007

**Mitchell-Bradford**

**THE MITCHELL-BRADFORD CHEMICAL COMPANY**
**Wampus Lane, Milford, Connecticut**

**QUALITY PRODUCTS OF CHEMICAL RESEARCH**



Cutaway view shows how corrosive liquids are prevented from touching metal in saran lined pipe and fitting.

# You can see why saran lined pipe is so corrosion resistant!

*It's steel pipe lined with durable saran . . . acids, alkalies can't harm it*

Corrosive liquids won't harm this pipe, its fittings or its valves. A thick, tough saran lining completely protects it from commonly used acids, alkalies, other corrosive liquids.

It's strong, too. Saran lined pipe will withstand working pressures up to 300 psi. Saran lined valves and fittings are available for working pressures of 150 and 300 psi. You can use the same supports you would use with ordinary steel pipe.

Ease of fabrication will keep your installation costs down. Cutting and threading can be readily accomplished in the field with conventional hand tools or power equipment.

For tomorrow's protection, investigate saran lined pipe today. THE DOW CHEMICAL COMPANY, Midland, Michigan.

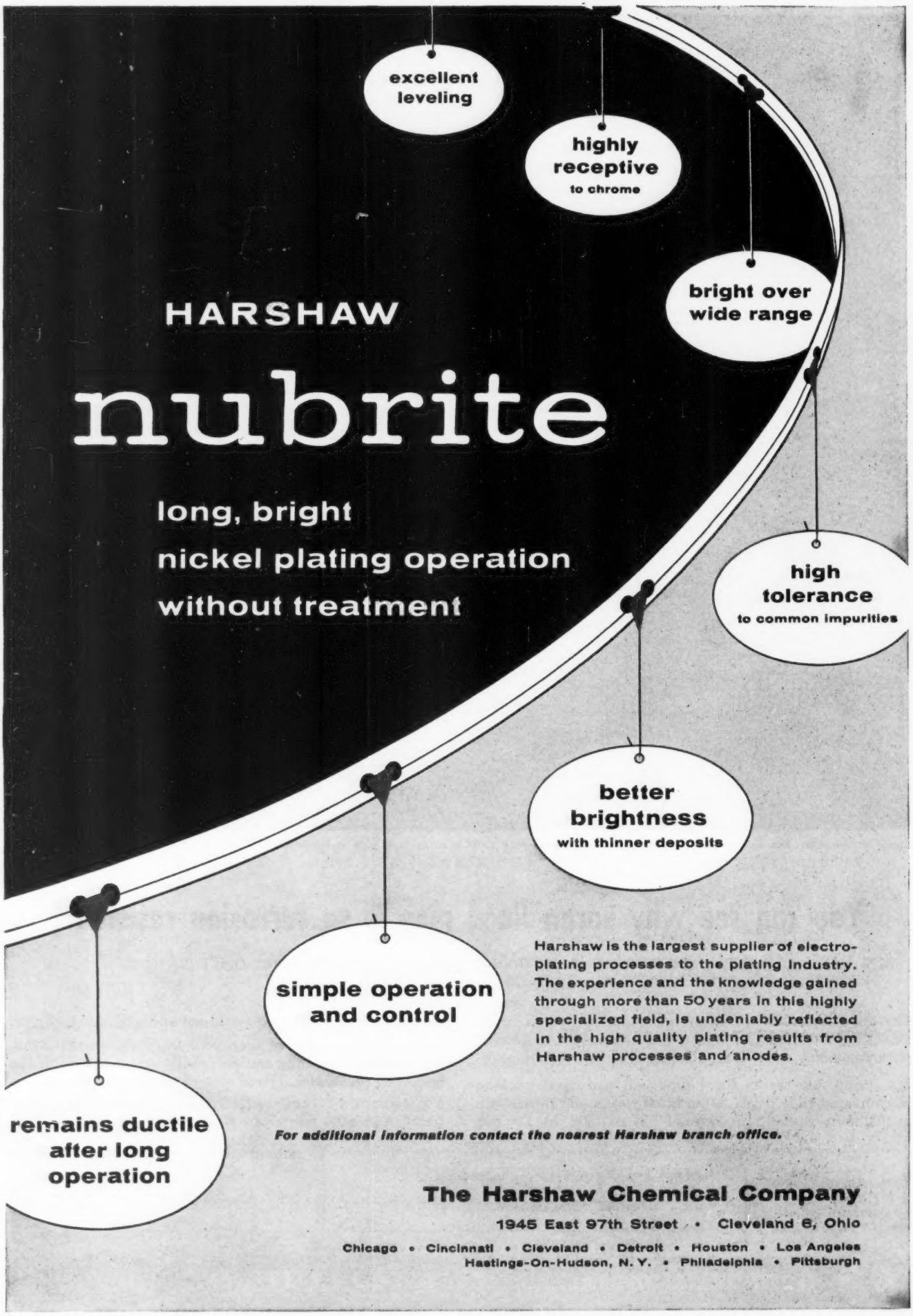
SARAN LINED PIPE COMPANY
DEPT. SP1591C
2415 BURDETTE AVENUE
FERNDALE 20, MICHIGAN

Please send me information on saran lined pipe, fittings and valves.

Name_____ Title_____ Company_____

Address_____ City_____ State_____

YOU CAN DEPEND ON DOW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bright over wide range
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long, bright nickel plating operation without treatment
high tolerance to common impurities
better brightness with thinner deposits
simple operation and control
remains ductile after long operation
Harshaw is the largest supplier of electroplating processes to the plating industry. The experience and the knowledge gained through more than 50 years in this highly specialized field, is undeniably reflected in the high quality plating results from Harshaw processes and anodes.
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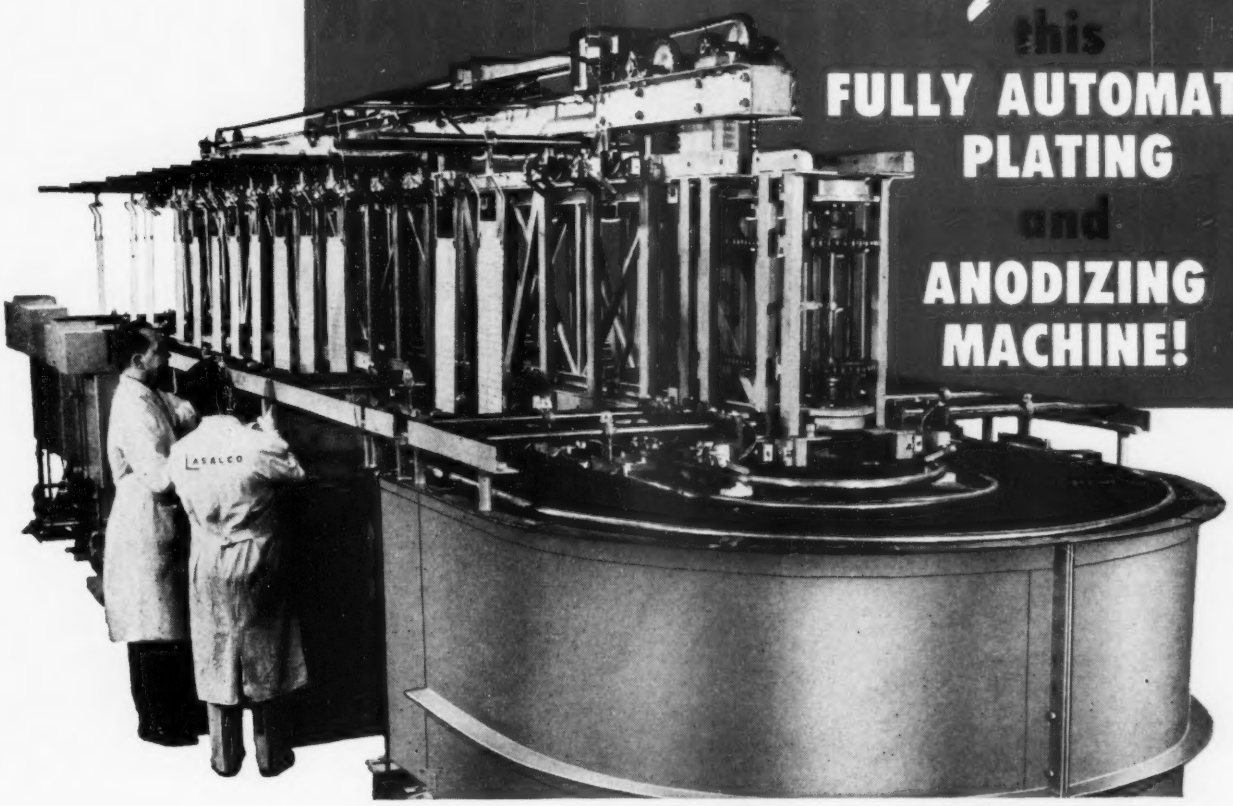
# One Man Can Operate this FULLY AUTOMATIC PLATING and ANODIZING MACHINE!




## LASALCO'S Cycleflex

- No costly overhaul or rebuilding is required for cycle changing on this *most versatile of all automatics*. Only the positions of pick-up heads need be moved, plus minor tank partition changes.
- All possibility of conveyor breakdown is eliminated with the electro-mechanical control and safety device. These make it impossible to push racks into side of tank and, in case of power failure during working transfer, prevents load from dropping.
- Because no elevating mechanism operates above rack carrier unusually low headroom is needed.
- Self-cleaning heavy duty contacts have positive 6-point connection . . . practically no attention is required.
- Tank surfaces are left clear by easily removable rack carriers . . . an advantage in servicing and in manual plating of large pieces.
- Automatic loading and unloading of parts from standard double-spine racks is available.
- Where conversion coatings and bright dips are used, a delayed set-down arrangement can be furnished to work automatically with the cycle.
- Where more than one cycle is required, machine can be made to include by-passing.

***Write For Brochure***

Hydraulic operation, standard; pneumatic operation, optional.

**MAIL THIS TODAY!**

Lasalco, Inc.
2820 LaSalle St.
St. Louis 4, Missouri

Send brochure on new fully automatic Cycleflex.

Company.....

Street Address.....

City.....Zone.....State.....

Signed.....

## LASALCO, INC.

**HOME OFFICE:** 2820 LaSalle St. • St. Louis 4, Mo. • PRospect 1-2990
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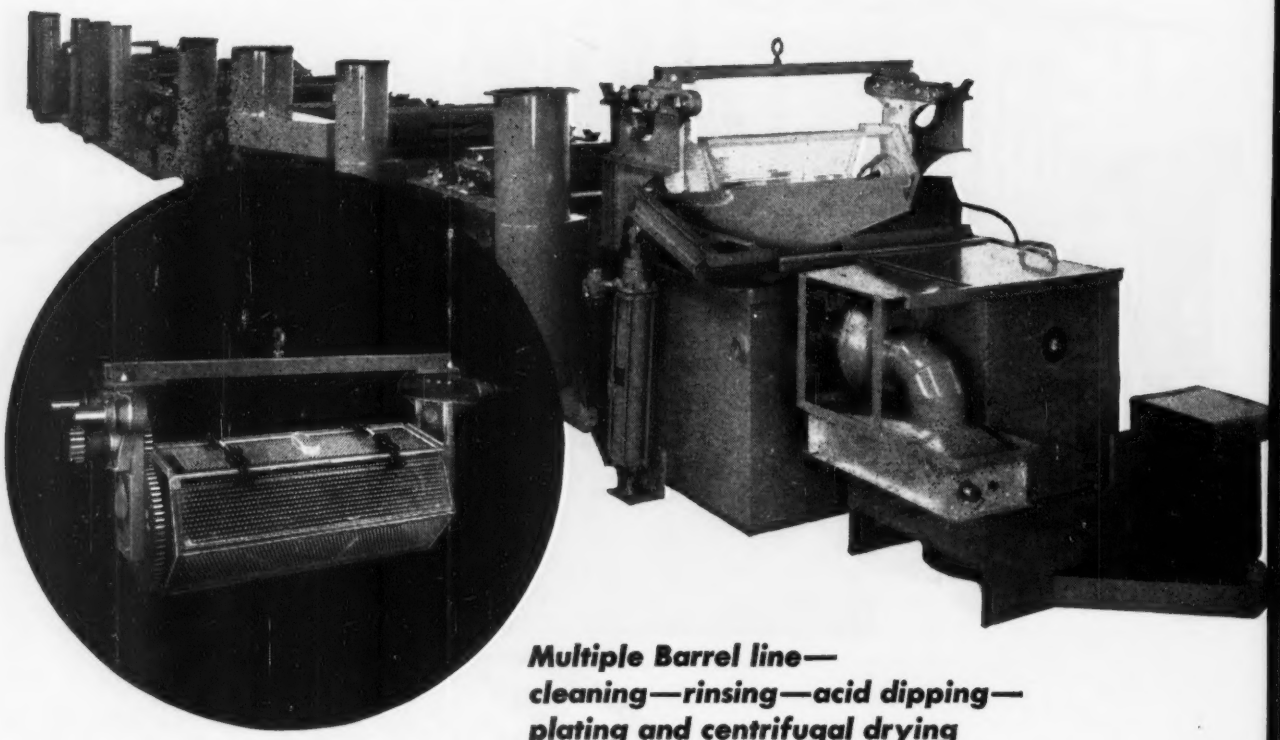
# CROWN PLATING BARRELS



***Multiple Barrel line—***
***cleaning—rinsing—acid dipping—***
***plating and centrifugal drying***

# CROWN LUCITE CYLINDERS

**Can be operated through the entire cycle**
**cleaning—rinsing—acid dipping—and plating solutions.**

**Whether your production requires a single barrel**
**or a multiple set up for cleaning, rinsing, acid dipping, and**
**plating, there are Crown barrels to fit the job.**

***Write for complete details***

**CROWN RHEOSTAT AND SUPPLY COMPANY**
3465 N. KIMBALL AVENUE • CHICAGO 18, ILLINOIS

***Now! An alkaline rust and smut remover that really works!***

# NEW WYANDOTTE FERLON

**Simple to use, foolproof in action . . . eliminates metal etching and hydrogen embrittlement . . . combines several operations into one**

Here's another new member of Wyandotte's complete line of advanced, top-quality metal-finishing products: Wyandotte FERLON! It's a versatile, fast-acting alkaline rust and smut remover — for use with or without current — that wins hands down over all other similar products in treating steel!

Here's what FERLON will do:

- **REMOVES RUST AND OXIDES** from steels, including stainless steels, without injury to sound metal. May be used as a simple immersion for light rust, or with current for heavy rust and some scales.
- **REMOVES WEATHER, HEAT, AND CHEMICAL STAINS** from steel, bronze, and copper alloys. Usually a simple dip is all that is required.
- **REMOVES SMUT.** FERLON may be added to steel electrocleaners for improved smut removal. Insures brighter electroplates, reduces roughness.
- **SHORTENS PLATING CYCLES.** FERLON eliminates the acid dip in some plating cycles — shortens cycle up to 30%.
- **REMOVES PHOSPHATE COATINGS AND PAINT** in the same tank with rust, scale, and smut, if desired.
- **ADAPTABLE** for soak tank or electrolytic use in existing equipment.

FERLON represents a big step forward in the metal-finishing industry. Chances are its versatility will shorten your production operations and save you money. Contact your nearest Wyandotte representative for a demonstration today. Or clip and mail coupon. *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also Los Nietos, California. Offices in principal cities.*

**Wyandotte CHEMICALS**

**J. B. FORD DIVISION**

***The Best in Chemical Products for Metal Finishing***

**Wyandotte Chemicals Corporation**
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☐ Please send latest FERLON data sheet

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# Special Reports
# On Finishing Non-Ferrous Metals

## NUMBER II—Paint Base, Corrosion-Resistant Finishing with Iridite

### WHAT IS IRIDITE®?

**Briefly, Iridite is the tradename for a specialized line of chromate conversion finishes. They are generally applied by dip, some by brush or spray, at or near room temperature, with automatic equipment or manual finishing facilities. During application, a chemical reaction occurs that produces a thin (.00002" max.) gel-like, complex chromate film of a non-porous nature on the surface of the metal. This film is an integral part of the metal itself, thus cannot flake, chip or peel. No special equipment, exhaust systems or specially trained personnel are required.**

Chromate conversion coatings are well known and accepted throughout industry as an economical means of providing corrosion protection, a good paint base and decorative finishes for non-ferrous metals. However, continued developments have been so rapid and widespread that many manufacturers may not be completely aware of the breadth of application of this type of finish. Hence, this digest of current information; to bring you up to date on the many ways in which you can obtain proper surface preparation for painting and increase product durability with a single multi-purpose chemical pretreatment. Report I on decorative, corrosion-resistant finishes and Report III on chemically polished, corrosion-resistant finishes are available on request.

First, it is an accepted fact that metal surfaces should be prepared before painting to make possible an efficient paint system. Naturally, this preparation should provide for good initial paint adhesion. Chemical treatments have proved extremely effective in this respect, particularly those of a neutral or preferably acid nature. Further, to be most efficient, chemical treatments should provide a non-porous barrier to maintain adhesion by sealing the metal from the paint and moisture. They should also provide a self-healing film which prevents lateral corrosion in the event that bare metal is exposed through scratching.

The Iridite chromate conversion coatings meet all these requirements. Iridite is a chemical conversion treatment for surface preparation. It provides initial paint bonding by molecular adhesion. It is acid in nature and produces a film that is gel-like and non-porous in structure. Thus, the Iridite film effectively seals the metal from the paint and from moisture penetration. Because the film contains certain relatively soluble constituents, it will protect areas scratched through to bare metal and prevent lateral corrosion. This is accomplished by a gradual leaching of these constituents into the damaged area.

Further, because of its gel-like, non-crystalline nature, the Iridite film will not affect the appearance or texture of the paint film, nor will it dust or powder to mar the painted surface. Because the film is non-porous, paint coverage is increased, thus substantial savings in paint costs will be realized. In addition, treated parts may be stored for long periods of time prior to painting without the risk of entrapped moisture causing blistering when painting.

Iridite chromate conversion coatings are widely used with equal ease and success under both baked and air-dried paint systems. While the actual adherence properties of the Iridite film do not increase appreciably with its thickness, corrosion protection does. The protection of the Iridite film is proportionate to its thickness and should be taken into consideration when selecting the Iridite to meet your needs. However, it is sometimes necessary to sacrifice maximum corrosion protection for appearance when a finished part is to be only partially painted. For example, it may be desirable to use a thin, clear, bright Iridite film if the unpainted areas must present a chrome-like appearance. A typical case is that of instrument housings on which the exterior is painted and the inside left unpainted.

On the other hand, if all surfaces of the product are to be painted and maximum corrosion protection is required, the heavier and most protective Iridite films should be used. For example, all surfaces of zinc die cast fruit juicers are finished with a highly protective Iridite film prior to painting to provide maximum resistance to the corrosive action of fruit juices.

Iridite finishes are now available for all commercial forms of the more commonly used non-ferrous metals, including zinc, cadmium, aluminum, magnesium, silver, copper, brass and bronze. In addition to providing an excellent base for paint, the Iridite films also have high decorative value when used as final finishes in themselves.

These films can produce a wide variety of pleasing appearances including clear bright, iridescent yellow, bronze, olive drab and brown. In addition, many films can be modified by bleaching or by dyeing. Among the dye colors available are various shades of red, yellow, green, blue or black.

In planning or designing, you should consider the many other characteristics of Iridite finishes which may enter into the specific problem. In addition to their functions as protective and decorative finishes, and as bases for organic finishes and bonding compounds, Iridites have low electrical resistance. Some can be soldered and welded. The film does not affect the dimensional stability of close tolerance parts.

Iridites are widely approved under both Armed Services and industrial specifications because of performance, low cost and savings of materials and equipment.

You can see then, that with the many factors to be considered, selection of the Iridite best suited to your product requires the services of a specialist. That's why Allied maintains a staff of competent Field Engineers—to help you select the Iridite to make your installation most efficient in improving the quality of your product. You'll find your Allied Field Engineer listed under "Plating Supplies" in your classified telephone book. Or, write direct and tell us your problem. Complete literature and data, as well as sample part processing, is available. Allied Research Products, Inc., 4004-06 East Monument Street, Baltimore 5, Maryland.

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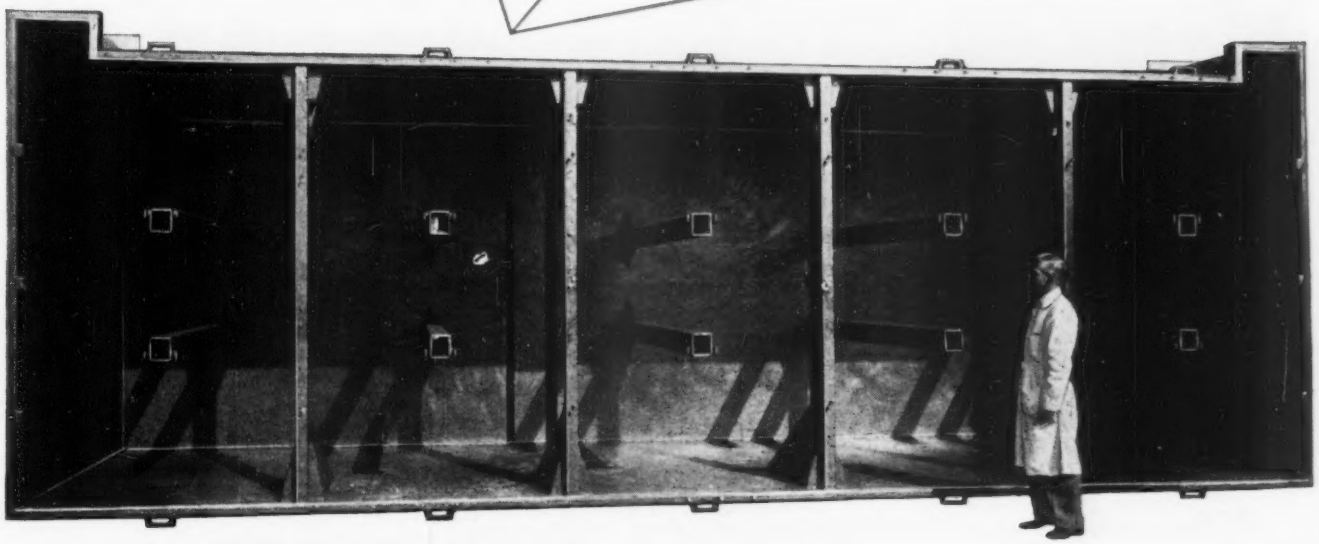

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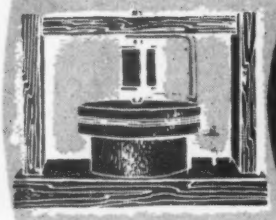

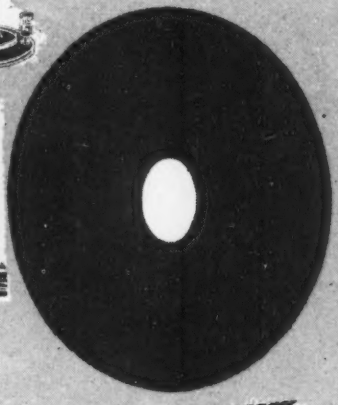

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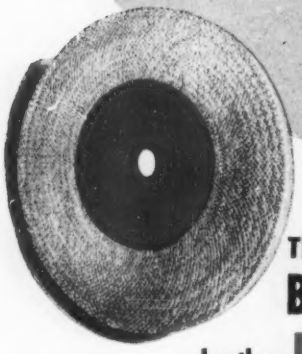

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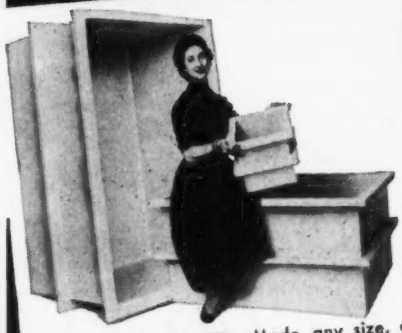

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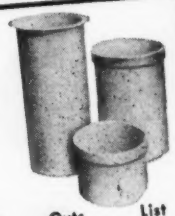

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|---|---|---|---|---|---|---|---|
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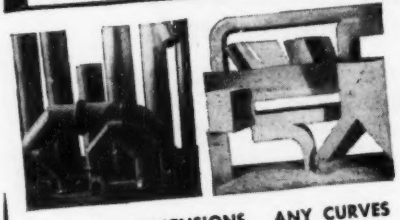

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JULY, 1957 Volume 55 Number 7

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# We Can Do It Better

The Federal Trade Commission has recently proposed new trade practice rules for the jewelry industry which, although they have the laudable objective of preventing deception as to gold content, thus protecting the consuming public, completely ignore the advances made in gold electroplating during the past few years .

Twenty-three years ago, when the last rules were promulgated, no one could reasonably object to restriction of terms like "Gold Overlay" and "Gold Plate" to gold applied only by lamination or mechanical means. The electroplating process was restricted to very thin deposits, suitable only for aesthetic purposes and without any appreciable wear or corrosion resistance. A later concession to our industry permitted use of the terms "Gold Electroplate" or "Electroplated Gold" if the deposit was greater than seven-millionths of an inch, otherwise it could only be termed "Gold Flashed" or "Gold Washed", appellations which, by no stretch of the imagination, could be considered complimentary.

Since the advent of bright plating gold solutions, capable of applying thick, hard deposits of controlled composition, there is no reason why electrodeposition should not take its proper place, now preempted by the mechanically bonded method, and be permitted designations now restricted to the older method of production. The consumer has been led to believe that a karat mark is one of quality, and denial of its use on articles coated by methods other than mechanical, even though demonstrably superior, is a perversion of governmental powers. Electrodeposited gold is superior because it is applied *after* forming and polishing, with resultant uniformity. Laminates are fabricated after the gold layer has been applied, with consequent distortion or even tearing of the coating, nonuniformity resulting from polishing operations, and raw edges which generally require subsequent electroplating, anyhow, in order to provide protection. With a bright electrodeposit there is no uncertainty as to how much of the gold layer has been removed from projections as a result of polishing and buffing because there is no polishing or buffing!

The consumer is not interested in how the gold is applied and employment of electrodeposition will neither mislead nor deceive him. We do not claim that it is necessary, or even desirable, to be permitted use of terms such as "Gold *Filled*" or "*Rolled* Gold Plate"; these can be left exclusively to the laminators because of the traditional concept of the words. However, we have a right to share terms which fit both methods. And, what objection would there be to the use of quality marks specific to our method of application, such as "Karatclad Gold" or "Electrofilled Gold", to name only two suggested terms? We would consider this preferable because the consumer will then be in a position to compare results and, in the long run, will unquestionably equate these terms with finishes of the highest quality, since we know we can do it better.

Nathaniel Hall

# Electroplating Is An Important Step in the Construction of a Man-made Satellite

By George W. Grupp

AN epochal event in the history of man may take place sometime during the second half of this year. Project VANGUARD, sponsored by the *National Academy of Sciences* and the *National Science Foundation*, and undertaken as a joint Army-Navy-Air Force project, under Navy management, and especially under the direction of the National Research Laboratory, will despatch from Patrick Air Force Base, Cape Canaveral, Florida, into outer space the first man-made moon with a mechanical brain.

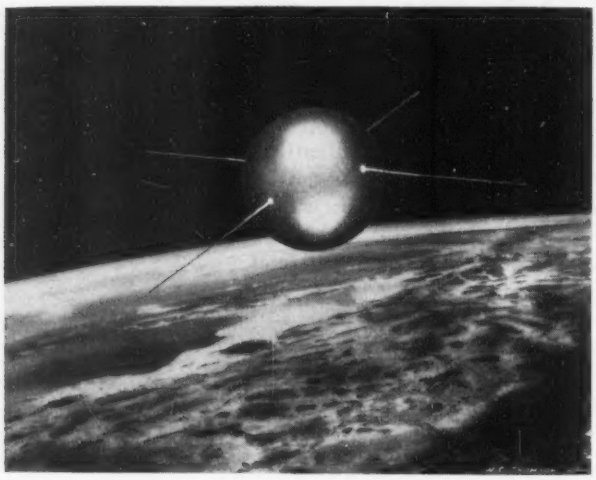
Ever since the descendants of Noah, in the land of Shinar, attempted to build "a tower whose top may reach heaven," man has been trying to penetrate into outer space. Until recent years, he has been unsuccessful. But, on February 24, 1949, with a Bumper-WAC, a two stage rocket, outer space was penetrated to an altitude of 250 miles above the earth, and it was accomplished with such tremendous speed that it reached this altitude, the highest ever reached by a rocket, in six and one-half minutes. This was followed by the firing of many other rockets with instruments to obtain useful information which, because of the life limitations of the rockets, had to be obtained in a few minutes.

Now, during the International Geophysical Year of 1957-1958 man hopes to send a mechanically brained satellite to an altitude of 250-300 miles to revolve around the earth. The mechanical brain of this satellite will send data to a dozen or more signal receiving stations located in different parts of the globe. And, after man receives this information he will have a better understanding of the earth and the solar system.

For example, the satellite will signal to the receiving stations on earth information on (1) the causes and formation of different kinds of weather cycles; (2) the densities, pressures, and temperatures outside our atmosphere; (3) the quantity of hydrogen in space; (4) cosmic, ultraviolet, and X-ray radiation outside our atmosphere; (5) meteor dust frequency and its effects; (6) the intensity of the earth's gravitational and magnetic fields; (7) the earth's reflectability of sunlight; (8) the effects of ionization; and (9) the rapidity of metal erosion in outer space.

The satellite will revolve about our planet every 90 minutes in an orbit beginning at about 250 to 300 miles about the earth's surface. In about 15 days the satellite's mechanical brain will be dead, but it will continue to revolve about the earth for many months. As the air drag causes it to draw closer and closer to the earth, and finally into the dense atmosphere, it then will disintegrate into space like a falling meteor.

All of this seems like a page torn from a fairy tale book, but scientists and engineers have progressively worked toward the building of a satellite for some years. The first official mention that men were working on this idea was made by Secretary of Defense



*Official U. S. Navy photograph.*

**Fig. 1. An artist's conception of the man-made earth satellite as it is passing over southwestern United States. Note the four antennas.**

*Official U. S. Navy photograph.*

**Fig. 2. Dr. J. P. Hagen of the Naval Research Laboratory and Director of the Project VANGUARD, standing beside a cutaway showing the mechanical brain of the satellite.**

*Official U. S. Navy photograph.*

**Fig. 3. Placing the gold plated top hemisphere of the satellite over gold plated bracing frames and a gold plated electronic instrument container.**

**Fig. 4. Polishing one of the hemispheres of a satellite with an 8" Canton flannel wheel operated at 3,700 r.p.m.**

*James Forrestal.* And, on July 29, 1955 President Eisenhower made this simple statement: "The United States, as a part of its contribution to the 1957-58 International Geophysical Year, will launch a small unmanned earth encircling satellite vehicle."

Glenn L. Martin Co. of Baltimore, Md., was awarded the prime contract for the building of the three stage rockets, but not for the satellite. This firm, in turn, sub-contracted some of its work to such concerns as the Allegheny Ballistic Laboratory of Cumberland, Md.; Central Rocket Co. of Redlands, California; General Electric Co. of Schenectady, N. Y.; Minneapolis-Honeywell Regulator Co. of Minneapolis, Minn.; and Vickers, Inc. of St. Louis, Mo.

The first stage rocket, which will use as fuel liquid oxygen and a mixture of ethyl alcohol, gasoline and silicone oil, will travel at the rate of 3,000 to 4,000 miles per hour for a distance of 30 to 40 miles in altitude before it burns out and drops off. The second stage rocket, which will use as fuel fuming nitric acid and dimethyl-hydrazine, will race through the atmosphere at a speed of 11,000 miles per hour, and will burn out and drop off at an altitude of 130 miles. The third stage rocket, which will use a presently unrevealed solid propellant fuel, will speed along at 18,000 miles per hour until it thrusts the satellite into its orbit in space at an altitude of 250-300 miles.

The satellite, which will be carried in the nose of the third stage rocket, will be protected against aerodynamic heating up to a temperature of 1,000°F. by a disposable cone.

Before the third stage rocket is ignited, the satellite will begin to spin. With this spin the satellite will be hurled from the third stage rocket. And it will continue to spin in its orbit until the eddy currents of the magnetic field on its metallic skin soon reduce the spin to a vanishing point. As the satellite travels in its orbit, it will be subject to temperatures ranging from zero to 400°F., every 90 minutes, as it passes through areas of darkness and sunlight.

It will readily be recognized that the design and materials used in the construction of the satellite required the solution of problems never before confronted by engineers and scientists.

Considerable thought had to be given to radiation cooling and radiation heating. Obviously the satellite had to be large enough to carry data-signaling instruments and to permit optical tracking at earth receiving data stations. It had to be small in size and low in weight to utilize a minimum of propelling power to get it into outer space. It had to be strong enough to withstand the pressures of outer space as it travels in its orbit at 18,000 miles per hour. It had to be stalwart enough to protect the instruments against high speed acceleration and vibrations during ascent and shock during launching. It had to be of a sturdy metal which would be able to stand up in the heat barrier (in its container) during the ascent and to be able to survive in the comparatively rapid extreme changes of temperature in its orbit. It had to be durable enough to resist metallic skin pitting action from micrometeorites—meteor dust. It had to be of a metal and finish which would produce maximum reflectivity to making tracking as easy as possible. And it had to be of a shape to prevent tumbling—a condition which would interfere with the satellite's radio telemetering of data to the ground.

To gain all this intelligence, a number of different models were designed. These models were tested under

simulated launching, flight, and orbital enviornmental conditions. And, naturally, a great deal of thought was given to different metals and their finish.

It was finally decided that the satellite should be spherical in shape so that it would always present the same surface shape in all directional movements. This is important since it will enable the scientists to measure air drag at high altitudes—a type of data which will be valuable in the construction of future manned space-vehicles.

The shell and internal bracing structure of the satellite were made of Dow FS-1 magnesium because it is lighter and less magnetic than aluminum. The hemispheres of the satellite were made of magnesium sheets about 0.0501 to 0.064 inches thick. These sheets were spun and machined to the desired shape and thickness. As might be expected, the thickness of the shell skin of the satellite is not absolutely uniform. This was necessary to safely anchor four antennas, the instrument mounting brackets, battery supports, and other gadgets.

As a result of careful calculation, the satellite was held to a diameter of 20 inches, and its weight (including shells, instruments, structural bracings, and four antennas) to a grand total of 21.5 pounds. An extra pound of weight would have required an additional 300 pounds of rocket fuel.

Once the shape, kind of basis metal, and kind of plating were decided upon, the Naval Research Laboratory awarded a contract to Brooks & Perkins, Inc. of Detroit for the construction of a number of satellite top and bottom hemisphere shells, internal bracing structures, and for the gold plating of all magnesium and plastic parts.

Before the gold plating specifications of the satellite were fixed, extensive experimental work was conducted in the Naval Research Laboratory plating shop to test the adhesion and other characteristics of gold plating on magnesium.

Fig. 5. Rubber gloves are used during finishing to avoid contamination.

Fig. 6. Racking a hemisphere of the satellite preparatory to plating.

The cycle of the pre-gold plating surface treatment of the satellite's magnesium surface consisted of nine steps. Every precaution was taken to keep the shop's working area clean. Care was taken to keep the work free from course grit or scratching materials. All surfaces were washed after each step. Rubber gloves were worn by the workmen in handling satellite parts.

### *Preplating Procedure*

( 1) The first step in the preplating procedure was that of checking the magnesium metal parts to see that they were of the correct thickness.

( 2) The next step was that of degreasing with trichlorethylene to remove all fingerprints, and oils collected during machining.

( 3) A random motion wheel was used to give the satellite parts a 320 grit wet paper treatment with a continuous flow of water on the surfaces. Each part was rotated to avoid local thinning, and to remove uniformly all unwanted materials.

( 4) The parts were carefully rinsed in cold water to make sure that all grit was removed from the metal.

( 5) Step No. 3 was repeated but with 600 grit wet paper.

( 6) The parts were then rinsed as in Step No. 4.

( 7) The parts were next polished with a 600 grit slurry, using a random motion wheel, and all parts were kept wet.

( 8) Next the parts were rinsed thoroughly as in Step No. 4.

( 9) In the final preplating step all parts were

buffed, using 8″ Canton flannel wheels, and the final polish was done with the same size and kind of buffing wheel. In both polishing operations the speed of the wheels was 3,700 r.p.m.

The inner and outer surfaces of the top and bottom hemispheres, the outer surface of the internal can, the outer surface of the can lid, the inside and outside of the three concentric cylinders and covers, as well as some other parts of the satellite, were given the pre-plating surface treatment steps 1 to 9 inclusive. The internal structural bracing of the satellite were merely smoothed with 400-450 grit paper, washed, and then gold plated without buffing.

### *Gold Plating Cycle*

The gold plating cycle of the earth satellite consisted of 24 steps.

( 1) All parts were degreased with trichlorethylene.

( 2) The parts were then placed in a soak cleaner for 3 to 5 minutes at a temperature of 180-190°F. in a solution of sodium carbonate—3 oz./gal., and sodium hydroxide—2 oz./gal.

( 3) The parts were then given a cold water rinse.

( 4) They were again cleaned.

( 5) After cleaning the parts, they were placed in an activator for three minutes at a temperature of 80 to 95°F. using a solution of 85 per cent phosphoric acid—1.6 pints/gal., and potassium fluoride—13 oz./gal.

( 6) Next, the parts were given a cold water rinse.

( 7) The rinse was followed by a zinc immersion coating, 0.0001 inches thick, at a temperature of 170-190°F. for 3 to 5 minutes in a mildly agitated solution of zinc sulfate—45 g./l., potassium fluoride—7 g./l., and tetrasodium pyrophosphate—210 g./l.

( 8) The parts were next given a cold water rinse.

( 9) After the rinse the parts were plated in a copper cyanide—Rochelle salt plating bath to provide them with a coating 0.0005 to 0.0008 inches thick. The solution consisted of copper cyanide—5.5 oz./gal., sodium cyanide—6.8 oz./gal., Rochelle salt—6.0 oz./gal., sodium carbonate—4 oz./gal., sodium hydroxide—1.0 oz./gal., and free cyanide—0.75 oz./gal., at a temperature of 150 to 160°F.

**Fig. 7. Spraying a peel coating on a satellite preparatory to shipment.**

*Official U. S. Army photograph.*

**Fig. 8. Mr. Alan B. Bradford, left, and Dr. George Hass, right, are seen inspecting the man-made earth satellite after it had received four molecular thick vacuum evaporated coatings over its gold plating. Note its reflectability.**

(10) This bath was followed by a cold water rinse.

(11) The rinse was followed by a 0.0003 to 0.0005 inch silverplate in a proprietary bright silver solution, at 90 to 110°F.

(12) Silver plating was followed by a cold water rinse.

(13) Next, the parts were given a hot water rinse and dried.

(14) When dry the parts were given a mechanical buffing treatment, using 8″ Canton flannel wheels.

(15) After buffing they were degreased with trichlorethylene.

(16) Next, the parts were placed in a cleaning solution as in Step No. 2.

(17) The parts were then given a cold water rinse.

(18) Following the rinse, the parts were plated in a proprietary bright gold solution for 3 minutes at 6 amp./sq./ft. to obtain a thickness of 0.00005 inches of gold plate.

(19) Plating was followed by a cold water rinse.

(20) After the parts were rinsed, they were placed in boiling water for fifteen minutes to seal and to prevent bleeding or spotting of the plate.

(21) When the parts were dry they were given a final buffing treatment to give them the sheen of a mirror bright finish.

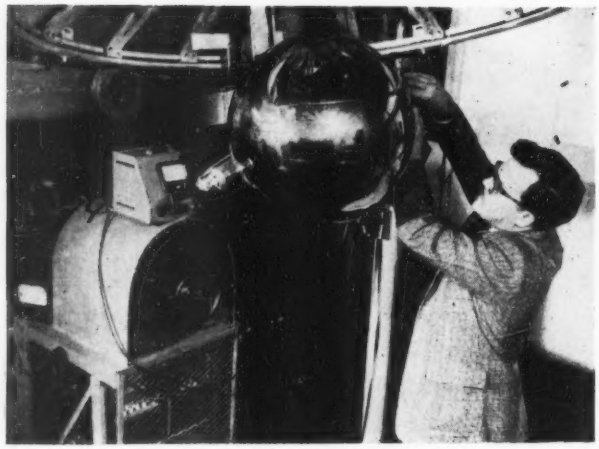
(22) Next they were placed into a cleaning solution similar to Step No. 2.

(23) The cleaning of the parts was followed by a cold water rinse.

(24) And, finally, the parts were thoroughly dried.

The outside and inside of the satellite's shell, and most internal parts as well as the housings of the instruments, were gold plated to provide a heat shield.

Plating racks were designed to meet the needs for each type of part. Whenever possible the existing threaded holes were used to hold the parts and to provide electrical contact. At first the racks for the



*Official U. S. Army photograph.*

**Fig. 9. An overall view of the vacuum evaporator apparatus, with its designer, Alan P. Bradford of the Army Engineers' Research and Development Laboratories, making some adjustments in fastening the gold plated satellite preparatory to giving it four molecular thick coatings by vacuum deposition.**

*Official U. S. Army photograph.*

**Fig. 10. Dr. George Hass inspecting the tank of the vacuum evaporator apparatus as the satellite and lid of the tank are being lowered.**

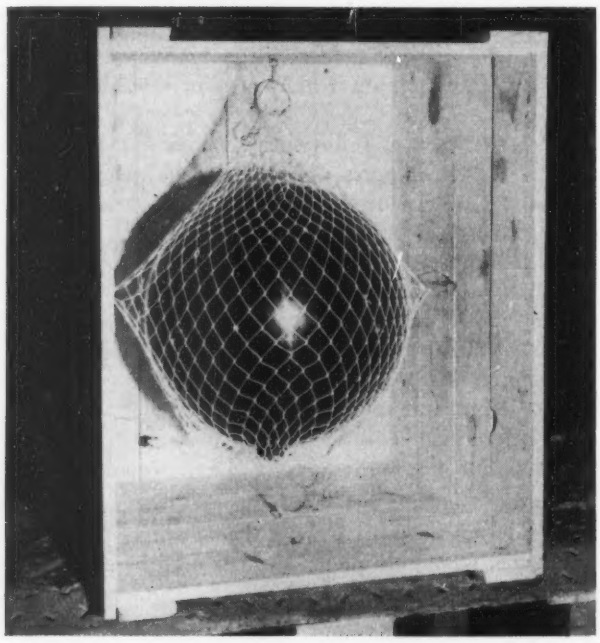


**Fig. 11. Satellite packed for shipment from Detroit to Washington.**

hemispheres were provided with current bleeders, but these bleeders were finally discontinued.

*George C. Orbits*, Special Project Engineer of Brooks & Perkins, Inc. in discussing the plating difficulties summed them up in this way:

"1. Absolute removal of all grease and buffing compounds from surfaces, drilled, and threaded holes was extremely difficult.

"2. Even though silver was applied directly after rinsing the parts coming from copper plating, a silver strike was found necessary to provide the desired adhesion.

"3. Special agitation was required since some parts were of such configuration so as to hold spent solution and thus decrease plating thickness and quality to those areas."

After completing the gold plating operations, the parts were sent to the Naval Research Laboratory at Washington for inspection and approval. Before shipping the spheres, peelable protective organic coatings were applied.

The top and bottom hemispheres of the satellite, after they were accepted, were sent to the Physics Research Laboratory of the Corps of Engineers Research and Development Laboratories at Fort Belvoir, Va. for vacuum metalizing.

While some of the vacuum metalizing procedure is still under wraps, it can be said that the satellite's outer gold plated surface was first cleaned, then chromium plated, given a coat of silicon monoxide, followed by a an aluminum deposit and, finally, given a coat of silicon monoxide. Each of these four coatings were of molecular thickness.

The purpose of coating the satellite's gold plating with additional protective coatings were: (1) to retard corrosion of the magnesium base; (2) to provide a highly absorbing surface which would stabilize temperatures; and (3) to attain the highest possible reflectivity.

To obtain a uniform coating thickness in the vacuum coating chamber apparatus, considerable thought had to be given to the shape of the satellite and to the arrangement of the vapor sources.

Like all other methods of metal deposition, vacuum evaporation coatings are only durable and adherent when the surface of the metal to be coated is free from grease, grit, absorbed water, etc. Such contaminating elements were, no doubt, removed by either vapor degreasing or ionic bombardment cleaning.

Project VANGUARD is directed by *Dr. John P. Hagen* with *J. Paul Walsh* as his deputy. In guiding this project to a successful conclusion Dr. Hagen had the cooperation of many scientists, engineers, and skilled mechanics of the Army, Navy, Air Force and government agencies, such as *Dr. George Hass,* Chief of the Physics Laboratory at the Army Engineers at Fort Belvoir, Va., as well as *Alan P. Bradford* of the same laboratory; also *Dr. Peter King,* Associate Director of Research for Materials of the Naval Research Laboratory. Others to contribute to the construction of the satellite were *John P. Manning,* Deputy Engineering Service Officer of the Naval Research Laboratory, and *Preston L. McGee,* Supervisor of the NRL electroplating shop.

# RACKS FOR ANODIZING

By J. E. Bunch, *Manager, Plating Equipment Divn., Automotive Rubber Co., Inc., Detroit, Mich.*

THE usage of anodized aluminum as decorative trim material by the automotive industry made its debut recently. One quality car manufacturer introduced its 1956 model with an anodized aluminum grille. The following 1957 model year saw the introduction of many anodized pieces of trim on practically all makes of cars.

Some of this usage may be a substitution for the relatively non-available and currently high priced nickel for plated ware. Recent government forecasts on the availability of nickel for consumer goods are not too encouraging; the five year forecast indicates a short supply until 1962. Many applications of anodized aluminum have been strictly upon the merit of cost and performance. The decorative anodizing industry is attaining stature and certainly is here to stay for the foreseeable future.

The rapid expansion of the industry is attended by all of the normal growing pains. Many of these problems are the result of the lack of "know how," and some are due to the lack of a broad dissemination of the acquired knowledge.

One of the greatest problems in the anodizing industry has been the lack of satisfactory racks. For production anodizing, racks should be specifically designed for each application, similar to other production equipment and tools. To accomplish this, a great many factors must be studied. The study for design starts with the specific process in use, the potential materials available for rack construction and insulating materials for coating the rack. Last but not least is the specific piece to be processed.

### *Design Factors*

Essential facts and factors which must be considered in designing these all important tools may be better analyzed if they are separated into local groups. These might be classified as basic, primary and secondary, each with individual sub-headings.

*Basic factors:*

Processing chemicals generally in use in production installations.

Metals available for rack construction and their characteristics.

Elastomers, for coating the rack, their characteristics and resistance to chemical reaction at given temperature.

*Primary factors:*

Equipment and/or machines used to perform the process. The piece to be processed, holding in position.

*Secondary factors:*

Holding and positioning of the piece to be processed. Mechanical design and construction of the rack. Insulation coating, compound formulation and methods of application.

Total cost; initial cost, life expectancy, maintenance cost, and performance results achieved.

### *Processing Chemicals*

Anodizing is a chemical and/or electrochemical process for the cleaning, brightening, application of a protective film, coloring, and sealing of the surface to prevent discoloration and corrosion. These processes are used for various metals, and many of the chemicals are very corrosive.

The racks used in this processing are subject to excessive corrosion; therefore it is necessary to understand just what chemicals are in use.

Recommendations for or against the use of any specific solution are not suggested. The use of any of these may or may not be infringement of proprietary patents. This table is merely to demonstrate the various corrosive elements.

The corrosive action of these elements increase sharply with increased operating temperatures. In some cases the reaction doubles with each 18° rise.

### *Metals for Racks*

Certain properties are required or desirable in the metal used for rack construction. Table II comparatively evaluates some of these physical properties.

(1) Difficult; special tools required, very costly.

(2) Frame sections fracture when bending; without special annealing and rehardening operations.

(3) So light weight, the rack may float upon transfer immersion.

(4) Spring tension holding members tend to soften

in use, resulting in poor electrical contact. Without positive contact, pieces are 'lost' in the processing tanks.

(5) Spring tension holding members permit use of the shock mount instead of a heavy rigid member. Spring shock mounts permit both the greatest ease of loading and unloading and at the same time assure positive electrical contact, regardless of vibration.

(6) Requires approximately 50% more cross sectional area for equal electrical conductor capacity.

(7) Military requirements and government restrictions permit only 10% of titanium produced for consumer goods at this time. Current (1-1-57) total annual production rate of titanium metal is only 8,000-9,000 tons, according to T.M.C.A.

The excessive cost per pound and the three to nine months delivery restrict the use of this metal. In small quantities per rack, used as removable contact tips only, this metal is recommended.

(8) Titanium used as a material for rack frame construction at this cost is purely a relative matter of economics. However, with the current cost per pound being from 10 to 30 times that of other metals, it is questionable.

### *Decorative Anodizing*

Decorative anodizing combines three distinct major functions:

(1) Bright dip; a chemical polishing and leveling operation. This removes from 0.0015″ to 0.0025″ of metal (in 90 to 150 seconds) from the surface of the piece being processed. Many of these solutions are basically phosphoric and nitric acid solutions of varying concentrations. All are operated at high temperature, 160° to 230°F.

(2) Anodizing; an electrochemical operation to create a semi-hard oxide film of 0.00015″ to 0.0002″ thickness on the surface being processed. Many of these solutions are a 15% sulfuric acid 85% water solution by volume, operated at 70°F. temperature.

(3) Coloring; various dye solutions. These do not adversely affect the rack. The rack material or the rack coating can seriously affect the dye solutions.

In addition to the major functions there are secondary operations.

1. Stripping; an operation for removal of the anodized surface from the contact tips of the rack. Titanium need not be stripped and the elimination of this operation (labor and materials) warrants the use of this costly metal in relatively small amounts.

2. Cleaning; certain highly chlorinated electrocleaning solutions and some petroleum soak cleaners can be injurious to coatings.

Aluminum dissolves in 85% phosphoric, 15% nitric acid solution, at 165°-170°, at a rate of 0.001″ thickness per minute of immersion.

Titanium is impervious to nitric acid; but has a fairly high corrosion rate in 5%-15% sulfuric acid solution at 70°F. This solution produces a violent pitting of the metal in a matter of a few hours, according to T.M.C.A.

None of the first three metals in Table II are satisfactory for anodizing racks without a corrosion resistant coating. With a satisfactory coating bonded to the rack metal, the listed metals can be used to make a satisfactory, superior rack.

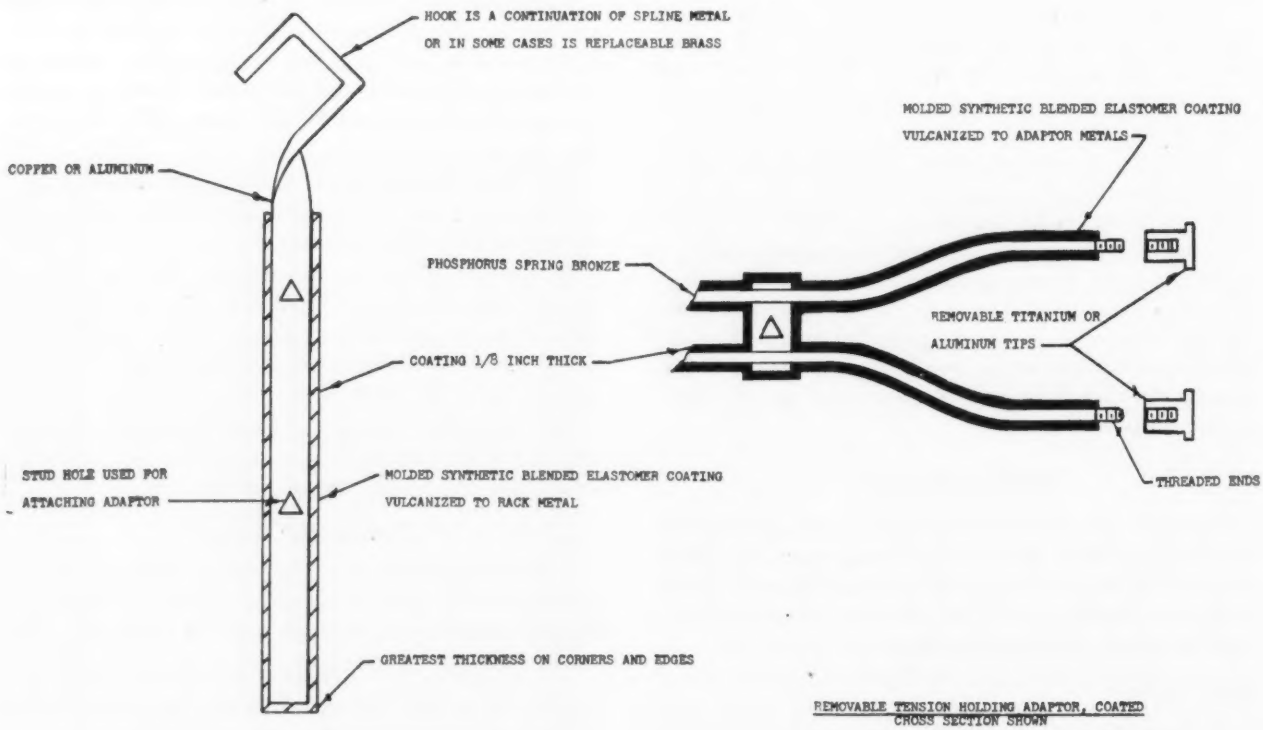

HOOK IS A CONTINUATION OF SPLINE METAL
OR IN SOME CASES IS REPLACEABLE BRASS
COPPER OR ALUMINUM
STUD HOLE USED FOR
ATTACHING ADAPTOR
COATING 1/8 INCH THICK
MOLDED SYNTHETIC BLENDED ELASTOMER COATING
VULCANIZED TO RACK METAL
GREATEST THICKNESS ON CORNERS AND EDGES
RACK SPLINE OR MAJOR STRUCTURAL MEMBER
CROSS SECTION SHOWN
MOLDED SYNTHETIC BLENDED ELASTOMER COATING
VULCANIZED TO ADAPTOR METALS
PHOSPHORUS SPRING BRONZE
REMOVABLE TITANIUM OR
ALUMINUM TIPS
THREADED ENDS
REMOVABLE TENSION HOLDING ADAPTOR, COATED
CROSS SECTION SHOWN

Fig. 1

**TABLE I**

| *Chemicals* | *Concentration* | *Time* | *Temperature* |
|---|---|---|---|
| Phosphoric acid (75%) | 94% by volume | 30-120 sec. | 160-180 F. |
| Nitric acid (65%) | 6% " " | | |
| Phosphoric acid (85%) | 80% " " | | |
| Acetic acid (glacial 99.5%) | 15% " " | 90-135 sec. | 190-212 F. |
| Nitric acid (60%) | 5% " " | | |
| Phosphoric acid (75%) | 75% " " | 60-150 sec. | 195-230 F. |
| Sulfuric acid (66 Baumé) | 25% " " | | |
| Phosphoric acid (85%) | 50% " " | | |
| Sulfuric acid (66 Baumé) | 40% " " | 30-120 sec. | 205-212 F. |
| Nitric acid (60%) | 10% " " | | |
| Phosphoric acid (85%) | 78% " " | | |
| Nitric acid (60%) | 11% " " | 60-120 sec. | 195-205 F. |
| Sulfuric acid (66 Baumé) | 11% " " | | |
| Water, demineralized | 15% by weight | 5-7 min. | 208-212 F. |
| Sulfuric acid (66 Baumé) solution | | 10-12 min. | 70 Fah. |
| Water, tap | 4-7 oz./gal. | 3-5 min. | 208-212 F. |
| Alkaline, T. S. P., etc. solution | | 1.5-3.0 min. | 195-205 F. |
| Caustic, solution | 4-5 oz./gal. | 3-5 min. | 190-200 F. |
| Nickel acetate, solution | 1/8 oz./gal. | 3-5 min. | 208-212 F. |
| pH 5.3 | | | |
| 7.0 | | | |
| Phosphoric acid (85%) | 85% by volume | 120-135 sec. | 160-180F. |
| Nitric (60%) | 15% " " | | |
| Nitric acid (60%) | 10% by weight | 120 seconds | 180F. |
| Sulphosuccinic acid | 0.5% by weight | | |
| Diethyl benzene | 10% by weight | | |
| Chromic acid | 30% by weight | 90-120 seconds | 170 F. |
| Sulfuric acid | 70% by weight | | |

**TABLE II**

| | *Aluminum* | *Copper* | *Phosphor-Bronze* | *Titanium* |
|---|---|---|---|---|
| Machinability | Good | Good | Fair | (1) Very poor |
| Formability | 6061T6 | 1/4 | 5%-#7 | TI-75 |
| | (2) Poor | Good | Fair | Poor |
| Tensile Strength | Fair | Good | Good | Excellent |
| Weight | (3) Poor | Good | Good | Fair |
| Spring Temper | (4) Poor | Good | (5) Excellent | Poor |
| Electrical Conductivity | (6) Fair | Excellent | Good | Poor |
| Availability | 2-4 weeks | 2-3 weeks | 2-4 weeks | (7) 3-9 months |
| Cost per pound (March 1957) | $0.64-$0.97 | $0.58-$0.62 | $0.96-$1.34 | (8) $12.50-20.00 |

### *Rack Coating Requirements*

(1) Resistance to chemical corrosion.

(2) Adhesion of coating to rack metal. Coating should be permanently bonded to the metal. The following test for adhesion is suggested. Bend coated ½" x 1" bar 90° with a ½" radius on inside and 1½" radius on outside. Heat by immersing in boiling water for five minutes. Cut coating on center of radius (tension side). Apply a pull test to the coating. Elastomer must fracture before adhesion to metal is lost.

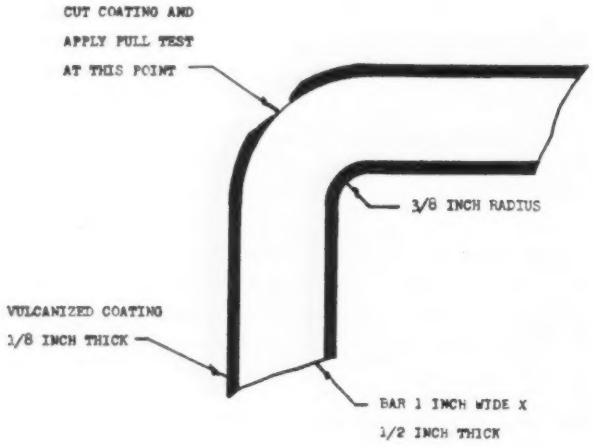



FIG. 2

CROSS SECTION SHOWN

(3) Coating as applied must have a dense structure and be free of any voids or fissures.

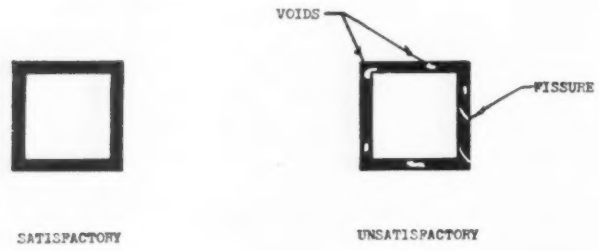



FIG. 3

CROSS SECTION SHOWN

Thermoplastic elastomers when applied by the dip method are prone to have voids. Thermosetting elastomers molded at 1000 psi have a satisfactory density and no voids.

(4) Thickness and distribution of coating. A satisfactory rack coating should be a minimum of ⅛" thick at all points. Examination of plastisol dipped coatings frequently show the characteristics exhibited in Figures 4A, B, C, and D. Thermosetting elastomers as shown by Figures 4E and F usually have an even distribution.

(5) Hardness, flexibility and elasticity. An elastomer coating gives the most satisfactory results when

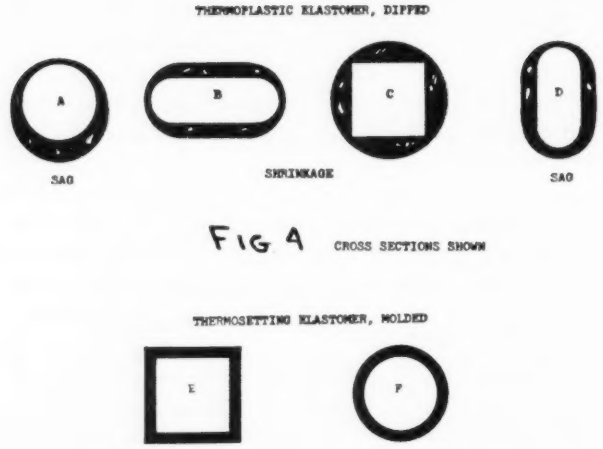



FIG 4 CROSS SECTIONS SHOWN

the hardness is controlled with the Shore A scale durometer between 40 and 80 points. Flexibility should be such that the coating will not crack with the continued flexing of tension holding members. Elasticity is required to permit forming tension members without affecting the adhesion.

(6) The joint between the removable titanium tip and the coating must be sealed. The elasticity and hardness must be proper to effectively seal the joint.

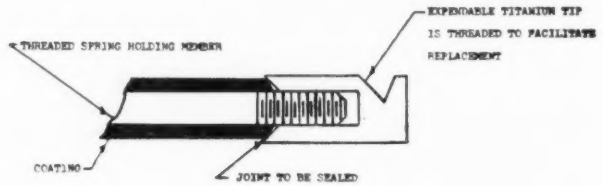



FIG. 5

CROSS SECTION SHOWN

### *Rack Design*

Equipment and plating machines are important in designing the rack. Machine design controls such factors of rack design as:

(1) The center distance between carrier arms.
(2) The design and spacing of the hooks.
(3) The hook center to work dimension.
(4) The current available for each rack.
(5) The work area within the tanks for the load.

These factors being generally constant for the life of the equipment, it becomes important to design the rack as an assembled unit. The frame of the assembled rack becomes a permanent tool and will last as long as the coating is maintained in good condition.

PARTS BEING PROCESSED:

Parts being processed frequently change from year to year and, in some cases, are entirely replaced with the introduction of a new part. For over-all economy, this factor emphasizes the need for an assembled rack design. The tension holding member (adaptor) is designed for one particular part, while the rack frame is designed for the machine. Therefore, to secure maximum utilization of the rack components the adaptor

**Table III Rack Coating**

PROPERTIES TO CONSIDER IN DETERMINING SUITABILITY OF MATERIAL FOR COATING OF ANODIZING RACKS.

| ELASTOMERIC MATERIALS | PHYSICAL | | | | | CHEMICAL | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | ADHESION TO METAL | DENSE STRUCTURE, FREE FROM VOIDS AND FISSURES | ELASTICITY-FLEXIBILITY RESISTANCE TO FRACTURE-ABRASION | THERMOSETTING | THERMOPLASTIC | 5% NITRIC AND 5% PHOSPHORIC ACID SOLUTION AT 210° F. | 10% NITRIC AND 90% PHOSPHORIC ACID SOLUTION AT 200° F. | 15% NITRIC AND 45% PHOSPHORIC ACID SOLUTION AT 180° F. | 5% CHROMIC ACID SOLUTION AT 170° F. | 17% SULPHURIC ACID SOLUTION AT 70° F. |
| NATURAL RUBBER, SOFT | E | E | F | YES | NO | U | U | U | U | E |
| NATURAL RUBBER, SEMI-HARD | E | E | U | YES | NO | U | U | U | U | E |
| NEOPRENE, SYNTHETIC RUBBER | E | E | E | YES | NO | U | U | U | U | E |
| NITRILE, SYNTHETIC RUBBER | E | E | E | YES | NO | U | U | U | U | E |
| BUTYL, SYNTHETIC RUBBER | E | E | E | YES | NO | U | U | U | F | E |
| HYPALON, SYNTHETIC RUBBER | E | E | E | YES | NO | U | F | F | F | E |
| | | | | | | | | | | |
| POLYVINYL CHLORIDE PLASTISOL, DIPPED | G | F | F | NO | YES | U | U | U | E | E |
| POLYETHYLENE | G | F | U | NO | YES | U | U | U | E | E |
| | | | | | | | | | | |
| SYNTHETIC BLENDED ELASTOMER | E | E | E | YES | NO | F | F | F | G | E |

E-EXCELLENT G-GOOD F-FAIR U-UNSATISFACTORY

CHEMICAL AND PHYSICAL PROPERTIES MAY BE DRASTICALLY ALTERED BY THE METHODS OF COMPOUNDING AND/OR CURING.

should be designed to permit quick and easy replacement. This feature can reduce rack repair labor as much as 90%.

PRIMARY FACTORS:

The piece to be processed must be securely held in position to prevent floating upon immersion in the tank. It must also be held securely for proper electrical contact. Heavy rigid holding members are not satisfactory, as parts must be easily and rapidly loaded and unloaded from the rack. The shock mount principal of construction in the design of the adoptor is ideal for this purpose.

1. Sufficient cross sectional area in the metal components to deliver the required amount of electrical current. Total area per piece, times the number of pieces per rack, times the current density per square foot of area for the particular solution in use.

2. Positioning the part to prevent contact with other parts. Spacing to prevent gassing from one part affecting other parts. Positioned in such a manner the part can drain, to eliminate drag-out losses and drag-in contamination of other solutions. Air must not be entrapped by an inverted position.

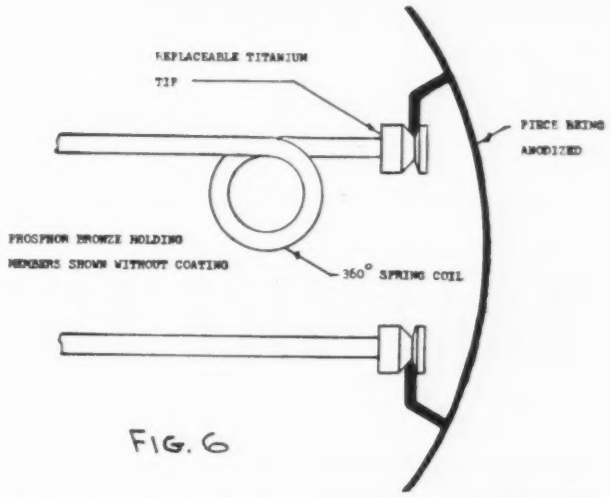

REPLACEABLE TITANIUM TIP
PIECE BEING ANODIZED
PHOSPHOR BRONZE HOLDING MEMBERS SHOWN WITHOUT COATING
360° SPRING COIL

FIG. 6

3. Position approximately equal area on each rack. Current supplied by the machine is set at a pre-determined density for all carrier arms. When the rack load varies, one rack may have insufficient current and the next rack an excess.

MECHANICAL DESIGN:

The rack should be designed with many factors in mind. First consideration is to create a tool that will satisfactorily perform the service for which it is intended. Secondly, the overall cost of the tool, which include and are dependent on:

1. Initial cost.
2. Maintenance and replacement cost.
3. Conversion cost to adapt the rack for some other part upon obsolescence of that piece for which it was designed.
4. Availability of material, such as titanium.

These factors indicate the following:

Rack frame to be constructed of copper or aluminum, designed for the machine.

Rack tension holding adaptors to be designed for the part. To be a readily removable and replaceable unit.

Rack frame and rack adaptors to be coated individually and then assembled into a unit.

Removable contact tips (expendable), made of titanium.

GASSING

SOLUTION DRAG-OUT AND DRAG-IN

AIR ENTRAPMENT

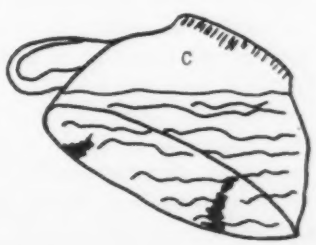



Figure 7.

# WHAT SIZE FILTER?

By Gunnar Gabrielson, *Swedish State Power Board, Stockholm, Sweden*

IN recent years, more and more attention has been paid to the maintenance and control of electroplating solutions, as a result of the great demands which nowadays are made on the coatings, and also because of the increased automation of plating equipments, involving continuous electrodeposition processes. It is the aim of this paper to treat in some detail the quantitative aspects of the continuous filtering of electroplating solutions.

### *Flow Rate Through the Filter*

From a technical and economical point of view it is, of course, very important that the amount of solution pumped through the filter per unit of time be well balanced. The higher the flow rate through the filter, the more impurities are removed. If the tolerable amount of impurities has been determined, it is uneconomical to pump so much of the solution through the filter per unit of time that the percentage of impurities in the plating bath becomes less than the standard. On the other hand, it is still worse if the flow rate through the filter is too low, whereby the amount of suspended impurities in the solution becomes so high, that deposits of inferior quality are obtained. Naturally, it is also important from an economical point of view that the size and cost of the filtering equipment be no more than necessary, which also requires determination of the correct flow rate through the filter. It is, therefore, from several points of view, very important to be able to estimate the most economical flow through the filter. How such an estimation is carried will be seen from the following discussion.

A plating tank with filtration unit is drawn schematically in Fig. 1. In this figure the tank has been equipped with diaphragms in order to prevent the impurities, emanating from the anodes, from reaching the cathodes, and it is assumed that the solution is pumped from the anode to the cathode compartments through the filter. In this way, a low overpressure is maintained from the cathode to the anode compartments, thereby diminishing the risk of migration of the suspended matter from the anodes to the cathodes.

For an estimation of the flow through the filter, required to keep the amount of impurities at a low, tolerable level, the following equation is used:

$$V.\frac{dc}{dt} = G\text{-}Q.C \quad \text{(Equation 1)}$$

where,

$V$ = total weight of solution in kg.
$C$ = concentration of impurities, p.p.m.
$\frac{dc}{dt}$ = increase in the concentration of impurities per unit of time.
$G$ = amount of impurities in kg. formed per unit of time.
$Q$ = flow rate of the solution in kg. per unit of time through the filter.

This equation simply means that the increase in the concentration of impurities in the solution, i.e. V.dc, is equal to the amount of impurities removed per unit of time at the passage through the filter, i.e. Q·C·dt, when it is assumed that the filter removes the impurities quantitatively.

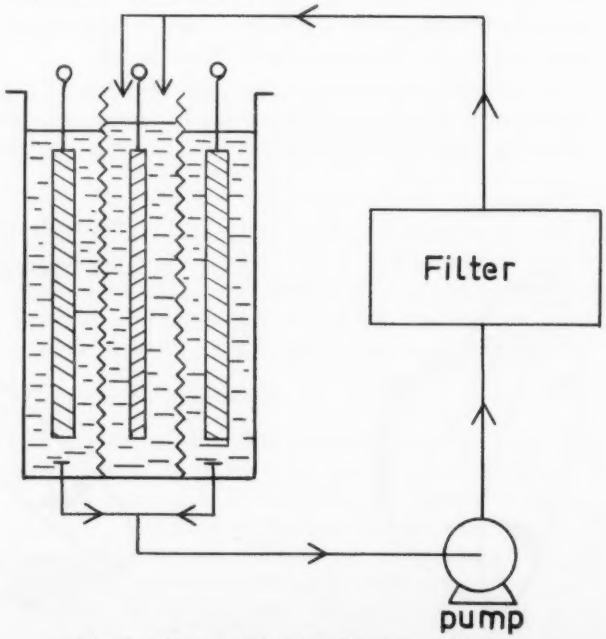



**Fig. 1. Plating tank with filtration equipment.**

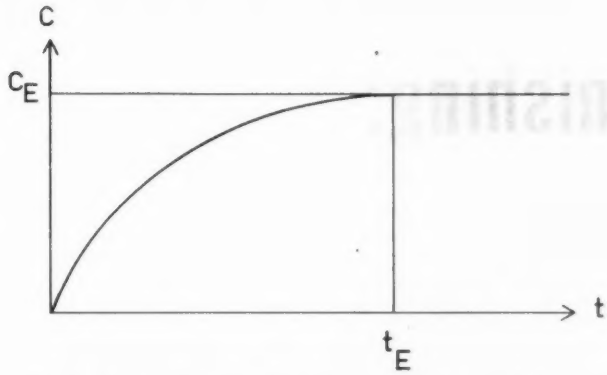



Fig. 2. Concentration of impurities as a function of time.

By rearrangement of (equation 1) and with integral signs we have:

$$\int_0^C \frac{V \cdot dC}{G - Q \cdot C} = \int_0^t dt \quad \text{(equation 2)}$$

from which the following expression is obtained:

$$C = \frac{G}{Q}\left(1 - e^{-\frac{Q \cdot t}{v}}\right) \quad \text{(equation 3)}$$

The last equation above may be considerably simplified through the following argument. The concentration, C, of the impurities as a function of the time t (t = O when electrolysis and filtration starts and the formation of impurities begins) is seen shown Figure 2. It is seen from this figure that C increases with time, but a state of equilibrium is reached, at the concentration $C_E$, when the amount of impurities formed per unit of time is equal to the amount removed by the filter per unit of time. This state of equilibrium is reached after $t_E$ units of time after the start of the process, which is seen from Fig. 2. According to equation 3 the following connection is valid at the equilibrium concentration:

$$C_E = \frac{G}{Q}\left(1 - e^{-\frac{Q}{v} t_E}\right) \quad \text{(equation 3a)}$$

The numerical value of $t_E$ is usually so high that the factor $e^{-\frac{Q}{v} t_E}$ may be ignored in comparison with the term 1. Therefore, (equation 3a) may be reduced to the following simple expression (when the notation $C_E$ is replaced by C for the sake of simplicity):

$$C = \frac{G}{Q} \quad \text{(equation 4)}$$

By rearrangement of this equation we obtain the following expression:

$$Q = \frac{G}{C} \quad \text{(equation 5)}$$

This equation means that the flow, which has to pass through the filter per unit of time, is determined by the amount of impurities, G, which are formed per unit of time and may easily be determined by experiments, and by the permissible concentration of impurities, C. The numerical value of C is then determined so that the critical percentage is not exceeded.

The results obtained above may be illustrated by the following example: Let us consider a cyanide copper plating bath, the volume of which is 1000 liters. The current passed through the bath during electrolysis is 500 amperes, whereby about 1,110 grams of copper are dissolved from the anodes per hour. It is assumed that 1 per cent of this is suspended in insoluble form in the solution; the amount of suspended particles formed per hour is therefore about 11 grams. If it has been found by experience that 5 grams of these impurities are tolerable in the copper bath, the allowed concentration is $\frac{5}{1000 \times 1200}$, when the specific gravity of the cyanide copper solution is assumed to be 1.2. By substituting (equation 5) above we have: $Q = \frac{11}{1{,}000} \div \frac{5}{1{,}000 \times 1200} = \frac{11 \times 1200}{5} = 950$ kg./hr. i.e., the flow rate through the filter is $\frac{2950}{60} \times 1.2 =$ about 60 liters per minute. At this filtration rate the permissible limit of impurities, 5 grams per 1000 liters, is not exceeded.

The calculations, shown above, are also applicable in every case where continuously formed impurities, are continuously removed in one way or another. As an example, we may mention the continuous removal of ionic impurities by means of ion exchangers, e.g. the removal of metal ions from chromic acid anodizing baths, if the metal ions are formed so rapidly that continuous filtration through a cation exchange resin is necessary.

### *Summary*

A mathematical treatment has been given for the continuous removal of continuously formed impurities in electroplating solutions. For an estimation of the flow Q, in kg. per unit of time, through the filter the following equation is valid:

$$Q = \frac{G}{C}$$

where G is the amount of impurities in kg., formed per unit of time and C is the maximum allowable concentration of impurities. This formula is valid for all processes where continuously formed impurities are continuously removed, e.g. the removal of suspended particles through filtration or the removal of dissolved ionic impurities through ion exchange.

# Institute of Metal Finishing: 1957 Annual Conference

THE 1957 Annual Conference of the British *Institute of Metal Finishing* was held from April 9th to 13th in the famous South-coast city and holiday resort of Brighton. The Conference was attended by upwards of 250 delegates, swollen by almost a hundred more on the last evening for the annual banquet of the Institute. Among the delegates were many visitors from abroad, including *Dr. F. A. Lowenheim* of the Metal and Thermit Corp. and *L. Newcomb* of Newcomb-Detroit Co. from the U.S.A. There were also representatives from Western Germany, France, Italy, Holland, Poland and Iran.

In addition to the technical papers presented to the conference, abstracts of which are given below, other highlights were the reading of the 4th Hothersall Memorial Lecture by *Dr. U. R. Evans*, noted pioneer worker in corrosion, and a film shown by *Dr. Pick* and *Dr. Wilcox* from Birmingham University who have developed a technique for filming the growth of electrodeposits through the microscope. This first example of a new technique for observing electroplating processes directly, showed the growth of copper deposits from a sulfate solution. A noteworthy trend in the organization of the technical sessions was the fact that no less than six out of the sixteen papers were contributed by the organic finishing group of the Institute, which is rapidly growing in numbers and importance.

One of the most topical subjects is that of leveling in electro-deposition, and two of the most interesting papers reported on research carried out at the *British Non-Ferrous Metals Ass'n* on the quantitative determination of leveling power of nickel and other solutions and its relation to cathode polarization and on work at Liverpool University on the mechanism of period-reverse plating. Other important technical papers were a contribution by the well known Italian electrochemist *Prof. Piontelli* on polarization in nickel solutions, a paper reporting further results obtained at the *Armaments Research and Development Establishment* on the effect of chromium and nickel plating on the fatigue strength of steel, and the description of a new research instrument for measuring internal stress of deposits as they are formed.

The president of the Institute of Metal Finishing, R. A. F. Hammond, and Mrs. Hammond with the Mayor of Brighton, Lewis Cohen (left) and the Mayoress.

Among other original papers, workers from the *Tin Research Institute* gave data on a new bright acid tin bath developed from solutions described first by Schlötter, and Discher and Mathers, and a critical review of the possibilities of automatic control in electroplating.

***An Investigation of the Mechanism of Leveling in Electrodeposition:***

*S. A. Watson* and *J. Edwards* (British Non-Ferrous Metals Research Association).

This paper reported on recent work at the B.N.F.M.R.A. into the nature of leveling in electroplating. The experiments were carried out on a copper phonograph record master with grooves 2 and 0.8 mil deep, and on 0.004 mil deep grooves ruled into copper by a diamond. Leveling power was determined microscopically (at 2,000×) and was measured as the difference between average plate thickness in recesses minus the thickness on the peaks, divided by average thickness. Cathode potential and cathode efficiency were also determined.

Experiments with nickel solutions showed no leveling in dull nickel solution containing P-toluene sulfonic acid (0.0009 M) and in a chloride nickel solution. Slight leveling was shown in a Watts type bath containing 15 g/l ferrous sulphate at 18° C, pH 3.2, 4.0 amp./dm$^2$. Two proprietary bright nickels gave leveling powers of 0.87 and 0.76, and of 0.44 and 0.32, at 2.0 and 4.0 amp./dm.$^2$ respectively. Iron-zinc alloy plating (developed by the British Iron and Steel Research Ass'n) gave a leveling power of 0.63 at 18.0 amp./dm.$^2$ Nickel-phosphorus plating gave no leveling.

A Watts nickel, at pH 4.0, 2.0 amp./dm.$^2$, 55°c and 15 minute plating time, gave a leveling power of 0.25. Additions of sym-diethly thiourea gave a leveling power of up to 3.67, Saccharine up to 0.45, quinoline ethiodide up to 1.07, thiourea up to 1.77, coumarine up to 1.35, and cadmium sulfate up to 1.06. In many cases, deposits were poor and of no practical value.

Leveling increased with increasing c.d. to a maximum, after which it decreased. The maximum occurs at higher c.d. at higher concentration.

Solutions showing leveling show a steep fall in cathode potential as concentration of leveller increases.

Microscopic examination showed that concentration of leveling agent in the deposit is usually higher at peaks than in hollows. The authors concluded that incorporated leveler reduces deposition potential. Removal of leveler by absorption or codeposition leads to a diffusion layer. As the rate of diffusion is greater to peaks than hollows and cathode potential is lower at peaks, current is diverted to hollows and the deposit is leveled.

Factors which increase the slope of the polarization—c.d.

curve, e.g., complexing of metal ions, improve throwing power but reduce leveling. Leveler concentration should be chosen to give maximum effect at a c.d. lower than the average c.d. used.

***The Influence of Reversal of Current upon the Surface Roughness of Electrodeposited Copper:***

*A. Hickling* and *H. P. Rothbaum* (University of Liverpool).

The authors studied the rate at which the deposit roughened with plating time in cyanide and acid sulfate solution during d.c. and P.R. plating. The cathode potential was also measured.

In unstirred cyanide solution, at above 5 amp./dm.$^2$, the anodic copper became passive, being covered by a black insoluble film at a potential of +0.4 v. Provided the anodic time was short, the copper remained active, however. At up ot 10 amp./dm.$^2$, cathode and anode efficiency are almost 100%. Normal P.R. conditions are, therefore, 10 sec. cathodic: 5 sec. anodic, at not above 10 amp./dm.$^2$

While d.c. produces fairly rapid roughening, P.R. leads to constant roughness dependent on the cathodic:anodic time ratio but independent of deposit thickness.

Stirring leads to smoothing in both d.c. and P.R. plating. Current density increase produces more uniform roughness, low c.d. tends to nodule growth.

In the sulfate bath roughening is much slower than in cyanide, with little difference between d.c. and P. R. Similar results were obtained in pyrophosphate copper solution.

***Production and Properties of Opaque Coatings by Chromic Acid Anodizing:***

*A. W. Brace* and *R. Peek* (Aluminium Laboratories Ltd. Bambury).

Experience in Britain hitherto has been exclusively with the Bengough-Stuart process (2.5-3% $CrO_3$). This paper reported on experiments with the more concentrated solution used at constant voltage [see Tarr, Willstrup and Tubbs, *Metal Finishing*, **40**, 106 (1942)]. Good results were achieved in 10% chromic acid solution at 130°F and 30 v, giving a 0.2 mil coating in 20 minutes and a 0.4 mil coating in 1 hour on aluminum and several wrought alloys as well as on some gravity die castings.

The opaque coating could be dyed yellow, bronze, orange, blue, turquoise, green, red, and black, using normal dyes and dyeing times of 5-10 minutes at 140-160°F (black 15 minutes). Orange-yellow to red-brown is obtained in 25 g/l ferric ammonium oxalate at 120°F.

The coatings had much higher flexibility than sulfuric acid coatings. Abrasion resistance measured by the Schuh and Kern method was less, though temperature resistance and, often, the corrosion resistance was markedly better than of sulfuric acid coatings. Opacity of the coatings appeared to be due to etching of the aluminum, during anodizing.

***Peen Plating:***

*G. H. Jenner* (Schori Division, F. W. Berk and Co. Ltd.) and *T. P. Hoar* (Cambridge University).

Peen plating developed in the U.S.A. has recently been made available in Great Britain and, as well as giving operating details, this paper reported an investigation of the coatings carried out at Cambridge University.

Parts are rotated together with the coating metal powder, an impacting medium, a 'promoter' solution and water in a rubber-lined polishing barrel. Typical articles include locks, nails, brads, hose clamps, lock washers, tempered fasteners, chains, hinges, padlock hasps, coat hooks, springs, all kinds of stampings and powder metal compacts. Coating metals include zinc, cadmium, aluminum, copper, lead, tin, brass, lead-tin and cadmium-tin alloys.

Before plating, the work is degreased, pickled, and generally given a 0.01 mil immersion copper deposit. Plating then proceeds using crushed steel grit, shot, steel wire cuttings, fused alumina chips, or glass balls as impacting material. Promoter solution is added, together with sufficient powder to plate the surface area required and water to 2" above the load.

Zinc can be plated to 0.1-2.0 mil, in approximately 1½ hours. 0.2 mil brass is plated in 2 hours. Zinc and cadmium

(Left to right) F. Wells (Albright & Wilson Ltd.), Dr. E. Roth (Riedel & Co., Germany) and S. A. Watson (British Non-Ferrous Metals Research Association).

coatings may be chromated. Plating time is approximately constant, independent of plate thickness. There is an induction period before plating starts after which all the metal is plated very rapidly.

The coating is formed by cold welding and has a laminated structure. The throwing power is excellent and the coating possesses good adhesion and is claimed to give superior salt spray and marine corrosion resistance compared to electrodeposited zinc of the same thickness. Technical advantages are: (i) no hydrogen embrittlement, (ii) plating sintered compacts and nitrided or carbonized parts, (iii) deposition of unorthodox alloys, (iv) plating of zinc, titanium, chromium, tin, etc. on glass, ceramics and abrasive grains, (v) as a method for introducing difficult alloy constituent.

Commercial advantages are: (i) large batch size, (ii) saving in metal (metal is plated almost 100%), (iii) low labor and capital cost.

***Electrodeposition of Tin as a Bright Coating:***

*A. M. Harper, A. Mohan* and *S. C. Britton* (Tin Research Institute).

Previous attempts to plate bright tin have been the Schlötter bath (Brit. Pat. 843,429, 1936) using wood tar in acid solution and a similar solution of Discher and Mathers [*J. Electrochem. Soc.*, **102**, 387 (1955)] using hard wood tar dispersed with octyl sulfuric acid, and it was this solution which was investigated at the Tin Research Institute.

Suitable tar is fractionated for hard or soft woods and the whole distillate is used, less water and light compounds. The tar is dispersed with octyl sulfuric acid or other sulfonated aliphatic alcohols.

A suitable solution contained:

| | |
|---|---|
| Stannous sulfate | 100 g/l. |
| Sulfuric acid | 140 " |
| Wood tar | 8 " |
| Octyl alcohol (sulfated) | 10 ml/l. |

Bright plate was obtained at 10-60 amp./ft.$^2$ with agitation to prevent gas streaking. At higher c.d. the plate tends to be brittle. Additions of brightening agent are made according to Hull cell test.

Cathode efficiency is 80°-95°%. Anode solution is as in normal stannous sulfate plating and anode bags and periodic filtering are recommended. Good results were obtained in pilot plant operation at 10-30 amp./ft.$^2$ on radio chassis, immersion heaters, and boxes. The solution is very dark and deposits must be cleaned in a cathodic cleaner to avoid stains. Barrel plating is carried out at 12-18 amp./ft.$^2$ in an immersed barrel.

Similar results were obtained in a chloride-fluoride electrolyte.

Brightness improves with higher tar content and higher c.d. Mirror bright deposits are brittle, however. Hardness is 30 V.P.N. Density and solderability are as for dull tin. Leveling is good. On mat tin, a 0.1 mil bright tin plate is fairly bright, a 0.5 mil plate is fully bright.

### *A Contribution to Knowledge of the Cathode Polarization Phenomena of Nickel:*

*R. Piontelli* and *G. Serravale* (Technological Institute, Milan, Italy).

Little is known about the cathode polarization of nickel except in sulfate and chloride solutions under particular conditions. The work reported in this paper, dealt with both these, as well as sulfamate, perchlorate and fluoborate solutions under a large variety of conditions. The apparatus used ensured uniform current distribution over an annulus-shaped electrode, potential being measured directly, using a side channel capillary to the reference electrode.

The results showed that current efficiency increases with increasing pH and current density. In sulfate solution and, to a smaller extent, in chloride and sulfate-chloride solution it also increases with rise in temperature. The opposite is true of sulfamate and pechlorate solutions.

In chloride solution, the electrode potential, E, rises with c.d. and is higher at lower temperatures. In sulfate solutions E is higher, and at lower temperatures, e.g. 25°C, the slope is non-linear. The effect in sulfate-chloride baths is intermediate. In sulfamate solution, the slope is regular, E being higher than in sulfate solution at 25°C and lower at higher temperatures. The slopes are higher than with sulfate solution. resulting in better throwing power. In perchlorate baths, the effect of pH is greater than in other solutions. In fluoborate solution, E is a little lower.

Conclusions from other experiments were that anodic overvoltage is only slightly less important than cathodic. In fused chlorides and non-aqueous solution, cathodic and anodic exchange overvoltage are negligible.

The same electrochemical inertia is seen with nickel amalgam electrodes and with electrodeposited nickel. It becomes less important when nickel is saturated with hydrogen.

The authors' conclusions support the view that the inertia of nickel is a function of a combination of the ionic properties, the structure of the metallic phase and the surface condition. Anions in the co-ordination shell of the dissolved metal or absorbed on the surface act as catalyst for the exchange reaction.

### *The Change of Fatigue Limit on Chromium or Nickel Plating with Particular Reference to the Strength of the Steel Base:*

*C. Williams* and *R. A. F. Hammond* (Armament Research and Development Establishment, Fort Halstead).

This paper continues earlier work carried out at A.R.D.E. on the influence of plated coatings on fatigue properties [c.f. *Trans Inst. Met. Fin.*, **32**, 85 (1955)] in which it was established that fatigue limit after chromium plating was independent of the ultimate tensile strength of the steel over the range 60/80 tons/in.$^2$ but was determined by internal stress and the intrinsic fatigue limit of the chromium (20/25 tons/in.$^2$ heat treated; 28 tons/in.$^2$ 'as plated').

In the present work with weaker steels, it was found that the percentage loss in fatigue strength after chromium plating is linear to the fatigue limit and other mechanical properties of the steel, making it possible to predict fatigue strength of plated components. The same holds for nickel plating, except that percentage loss in fatigue strength increases markedly with thickness of nickel.

On Armco iron, carbon steels (0.15, 0.3, 0.5 and 0.9 C normalized) 0.5 C steel quenched and tempered at 650°, 430° and 200°C and 18/8 stainless steel, chromium plating increased fatigue strength of materials with fatigue limits 17-19 tons/in.$^2$ and decreased the fatigue limit on stronger steels. In confirmation of the conclusions on nickel, high tensile stress in the deposit was found to be associated with high percentage loss in fatigue strength while zero or compressive stress, resulting from an addition of sodium napthalene trisulfonate to a Watts bath, increased the fatigue limit of weaker steels, stronger steels showing a substantial loss. With one exception, percentage loss in fatigue strength was greater for thicker deposits, while lapping showed a significant improvement.

The authors concluded that, for steels with fatigue limits below 18 tons/in.$^2$, failure starts at the plate-steel interface. With stronger steels, the plate fails first when the applied stress plus internal stress of the coating metal reaches the latter's fatigue limit, though cracks will not propagate into the steel to cause component failure until the stress concentration at the root of the crack approaches the fatigue limit of the steel. A formula designed for predicting percentage change in fatigue strength after chromium plating is:

$$L = 50 - T - 3I \text{ or } L = 50 - \frac{H}{5} - 3I$$

Where L is percentage change in fatigue limit, I is mean internal stress of the deposit, T is the U.T.S. (tons/in.$^2$) and H is the Hardness (D.P.H.) of the steel.

M. L. Alkan (M. L. Alkan Ltd.) and Dr. H. M. Heiling (Langbein-Pfanhauser Werke A.G., Germany) being presented to the Mayor.

### *An Instrument for the Continuous Measurement of Stress in Electrodeposits:*

*T. P. Hoar* and *D. J. Arrowsmith* (University of Cambridge).

Several methods of determining internal stress of electrodeposits have been developed. The new instrument described in this paper has the advantage that the specimen is not allowed to bend, but is kept straight by means of a measured electromagnetic restoring force, applied to the free end of the strip which is held rigidly at the lower end. The upper end, which projects through the surface of the solution, carries a light armature of thin iron wire at each end of which solenoids are fitted, for tensile and compressive stress respectively. Movement of the free end of the strip about the 'null' position is observed by an optical lever and the current through either solenoid, required to just prevent bending, is a measure of the stress. In use, the strip is stopped off one side, and plated at constant current, using shields to keep the c.d. uniform. A cover with viewing glass and a vibration-free base is provided.

Results obtained with the instrument in Watts nickel plating showed that the addition of 1.1 g/l naphthalene trisulfonic acid reversed stress during plating itself, indicating that the real stress-relieving agent may be a cathodic reduction product of N.T.S. It was also found that, if plating current was stopped, mean tensile stress continued to increase at a slow and diminishing rate, while compressive stress decreased with time, representing the approach to the final thermodynamic equilibrium of the nickel.

### *Possibilities of Automatic Control in the Electroplating Industry*

*J. W. Cuthbertson* and *J. E. Parton* (University of Nottingham).

The authors distinguished between four types of control systems: sequence controls, regulators, servomechanisms and process controls. Controls may also be open-loop. Sequence controls are usually open loop, the others are always closed loop.

Sequence controls ensure that a pre-selected sequence of operations is carried out. Regulators control temperature, liquid-level, voltage, etc. and are either discontinuous (con-

trol action starts when the error exceeds a certain value) as in a thermostat, or continuous (corrective action proceeds constantly and its magnitude is proportional to the error).

In servomechanisms, input instructions are constantly changed (e.g. heat transfer, pneumatic propagation in control of fluids). Closed loop process control with continuous action is most applicable to electroplating. In automatic plating, the important variables are (1) temperature, — controlled by thermostat (2) current density, — not easy to control as c.d. meters are accurate only if the cathode area and shape are uniform (current on the other hand can be closely controlled) (3) electrolyte composition, — probably too complicated to control except for metal concentration and pH; (4) electrode dimensions, — related to current density control and in which, in the future, it might be possible to provide multi-anode assemblies with controlled adaptation to the cathode surface. (5) agitation, — possible to control automatically. If it becomes possible to control all five variables, these may be linked into an integrated multi-loop system to control the interaction of variables, with a master-controller system with a central computer, self-optimizing for different assemblies.

### *The Cleansing of Intricate Parts:*

*H. Silman* and *J. E. Entwhistle* (Electro-Chemical Engineering Co. Ltd.).

In this review of modern cleaning methods, the authors described new vapor degreasing equipment which include fully immersed semi- and fully automatic vapor, liquid-vapor and spray cleaning units which are widely replacing open-topped equipment by saving labor cost and cutting solvent loss.

Most recent emulsion cleaners are of the di-phase type with a hydrocarbon oil-fatty acid solvent phase and an aqueous solvent emulsion phase containing surface active agents. Use of these in spray machines are much cheaper than vapor degreasing, though the surface remains wet — a disadvantage for some purposes.

Newest and most important development is ultrasonic cleaning. The high cost of the plant which consists of a tunable oscillator, power amplifier, transducer and glass or stainless steel container, is compensated by cleaning speed and efficiency. Chlorinated hydrocarbons are generally used; aqueous solvents being restricted to low frequency oscillators.

Transducers may be piezoelectric crystals, e.g., quartz or plates of barium titanate, or magnetostrictive materials, e.g., nickel or cobalt alloys. The latter type are used at frequencies below 40 Kc, the former for higher ranges, quartz being best for small plants, barium titanate for larger installations. Size of transducer or plates is adjusted to the mechanical resonance and the work may be stationary or conveyerized. The high frequency energy is produced by a high voltage tube oscillator, the shock waves producing vibration and cavitation in the solvent. Magnetostrictive transducers are used for high power application over long periods, but require cooling. Best results are with work close to a transducer of similar area. Remote or complex surfaces require lower frequencies.

For small work e.g. watch components, frequencies of 400 Kc are best, lower frequencies being used for larger articles. The denser the solvent, the higher cavitation and the better the cleaning effect. High temperature and volatility are unfavorable and 90°-110°F is used with trichlorethylene, 110°-160°F with aqueous solvents. Typical applications include small ball bearings, balls for pens, hydraulic components, servo-motor laminations and commutators, fine screw threads and worms, gears, electric shaver heads, needle valves, fuel injector nozzles, carburetors and radio tube parts. Complicated parts are revolved in racks or in a barrel above the sound head, or the solvent container may be partially evacuated to prevent air pockets.

**Some visitors from abroad. (Left to right) T. Zak, delegate from Electrodeposition Research Institute in Poland, F. Enrico (Fiat Motor Co., Italy) and P. Morisset (Centre d'Information du Chrom Dur, France).**

### *The Adhesion of Surface Coatings:*

*W. D. May, N. D. P. Smith* and *C. I. Snow* (Imperial Chemical Industries Ltd., Paints Division).

The authors reviewed adhesion tests which are of four types:

(1) Applying a force to the free surface; i.e., pulling on a test piece cemented to the surface. These include tensile methods. The cohesive strength of the coating must exceed the bond strength. Moreover, stress at the edges is non-uniform and choice of adhesive is difficult. Best results are obtained on rigid substrata, i.e., two bolts with faced-off, painted ends are stuck together with cold hardening epoxy adhesive. The pull required to separate the bolts in a Hounsfield Tensometer measures adhesion to ± 10%.

(2) Peeling by forcing a wedge shaped tool between coating and substratum or pulling on fibre strip in or attached to coating. These include the Interchemical Adherometer, which measures the force required by a sharp ivory knife to strip a 1 mm wide film. This test assumes that adhesion is independent of film thickness. In another test, silk, the width of the panel, is embedded in a wet coat, a second coat is applied, dried and the force required to pull the silk off 1 cm wide strips is measured. Alternatively, adhesive cellulose tape is used.

(3) Force is applied to the underside of the coating. In one test satisfactory for tough multi-coat films, a hole is drilled into the panel which is painted, while the hole being temporarily blocked. Air is applied through the hole and the pressure required to remove the paint is measured.

(4) The coating is detached by accelerating the substratum. This includes Moses' and Witt's method, in which the end of an aluminium alloy rod is painted and vibrated with ultrasonics, obtaining acceleration of 200,000 g. A later method used rotation in vacuum of a magnetically suspended steel rotor carrying a spot of paint and achieved an acceleration of 15 million g, i.e., sufficient to measure adhesion up to 4,000 psi.

A new method developed by the authors utilizes deceleration. A thin steel disc with a coated spot is fired from a ⅜ in. air gun at a steel target with a ⅛ in. hole aligned to the coated spot. Bullets are fired at different velocities and, when the deceleration is high enough (over 27 million g, corresponding to 7,000 psi, can be achieved) the paint is detached. The method uses normal test panels which can be subjected to weather, high humidity, etc., and measures adhesion in absolute units independent of other factors.

### *Advances in Spray Booth and Oven Design:*

*A. L. Newcombe* (Newcombe-Detroit Co., Detroit, Mich.).

This paper reviewed recent progress in booth and oven design. The author referred to new U. S. standards for increasing the efficiency of water wash spray booths. According to factory regulations and experience, air velocity should be 100-150 ft./min. in a side draft booth and 150-200 cu. ft. per linear ft. of tunnel for down draft tunnels. Air heating costs make it essential to determine the air volume required. Some users are setting allowable limits of paint pigments discharged per cu. ft. of air. New designs emphasize access to the interior of the washer, removability of water piping and inspection doors. Air washing efficiency is measured by evacuating 30-40 cu. ft. from the discharge stack through a 6 in. by 1½ in. dia. paper filter thimble, measuring the gain

in weight. Performance tests during production ensure that booth installation is satisfactory.

Over-spray dripping onto freshly sprayed parts is avoided by even distribution of exhaust air and air distribution baffles. A pressurized vestibule, in which conditioned air is supplied at both ends, maintains correct air balance. The ends have silhouetted openings for work passage and the air velocity is 100-150 ft./min. Automatic dampers control the pressure.

There is no perfect answer yet to the dust filtering problem or paint waste disposal. Sludge is usually removed at the spray booth to a large settling tank.

Conveyorized floor grating or plates attached to the roller chains travelling at 6 in./min. pass through a spray type chain washer to clean off pigments, return chains sometimes being used as scrapers to remove sludge from tanks. Dry type spray booths are also used, incorporating cheap throw-away paper filters at the back or a flame-proof felt cloth to trap overspray. Direct gas fired heaters are used, in the U.S.A. Oil fired air heaters have proved satisfactory in Holland.

In oven design the main American trend is toward larger air volumes in the heat recirculating systems to speed drying and air distribution. Scroll type direct fired gas heaters are used in England for moisture drying and primers, and in the U.S.A. for synthetic enamels. Oil fired oven heaters are usually up to indirect type, combustion products passing through heat-exchangers. In large air volume ovens, air recirculation ducts are generally at the top, leaving walls and floor free from dust, the oven being coated with a film which traps dust. Long ovens are zoned, each zone being 50-75 ft. long. Closer control includes charts which record progressive temperatures throughout its length, and exhaust and recirculation ducts arranged to level out hot and cold spots. Heat distribution and air volume are also tested. Catalytic combustion systems for heat conservation and exhaust fume are being developed.

### *The Application of Finishing Materials at Controlled Temperatures:*

*J. Muihead* (Aerograph Co. Ltd.).

In hot spraying, developed since 1939, the paint is heated, permitting much higher solid contents and reduction in solvents. At 160°F, viscosity is reduced to ¼ or ⅓ of that at 70°F. Above 160°F there is little change in the viscosity of synthetic enamels, though cellulose lacquers may be heated beyond this. Normal finishing materials are extended with thinner (10%-15% with lacquers) and 5%-10% retarder, for hot spraying. Lack of viscosity control may cause orange-peel, over-spray or low film build, hitherto often cured by increasing the air pressure, thus requiring a higher number of coats.

The advantages of hot spraying are:

(1) *Reduction in Paint Losses.* Less thinners are used and over-spray (normally 20%-50%) much reduced. Solvent loss due to evaporation is higher and this is desirable.

(2) *Elimination of Rejects.* Runs, incomplete coverage and blistering are largely eliminated and there is less risk of sagging, orange-peel and porosity since the film is disturbed less by solvent evaporation. Shrinkage is reduced and filling improved.

(3) *Increased Production.* Slower gun motion is used and with one stroke the equivalent of two are sprayed. Spraying time is reduced, particularly with cellulose lacquers where one coat replaces two or three applied cold. Drying time is also reduced.

Hot spraying of lacquers is more difficult than synthetics, as solvent evaporation varies, partly due to difference in solvent retention. Some lacquers do not flow out as well and vaporization inside the heating unit may lead to foaming and sputtering, requiring a pressure feed tank for new material. Such troubles are avoided in non-circulating type of equipment. Flow rate varies between ½-3 pints per minute depending on nozzle orifice, length and diameter of fluid hose, and viscosity. At over 2 pints per minute some lacquers tend to bubble, due to entrapment of solvent vapor and air in the fast-setting film, particularly at high shop temperatures, or when the spraying motion is too slow. The operator must be familiar with the lacquer and the film thickness of the cold system he replaces. Equipment varies from a small laboratory units for touch-up work to a large production unit capable of multi-gun operation at 200 gal. per hour.

### *Airless Spraying:*

*T. Cowlard* (T. C. Spray Finishing Systems).

Airless spraying, developed in the U.S.A., is a combination of hot spraying with the use of hydraulic power. Temperatures up to 160°F for cellulose lacquers and 200°-210°F for enamels, synthetics, neoprene, epoxy resins, chlorinated rubber, and vinyls are used at 300-600 psi. The paint is heated to a point at which the lower boiling solvents have a vapor pressure of 3-25 psi above atmospheric, whereupon, sudden release of pressure creates rapid expansion. The paint is moved by a ram pump via a 4 kw paint heater to the gun which has a fluid metering control with varying sizes of accurately angled tungsten carbide nozzles required for different paint volumes. The Teflon lined hose is sheathed with stainless steel braiding. A safety valve on the feed line opens if the inlet pressure exceeds 50 psi, while a relief valve opens if the hydraulic pressure exceeds 650 psi.

The advantages of airless spraying are:

(1) Reduction in overspray.

(2) Reduction in health hazards, particularly for inside spraying.

(3) Exhaust is required only to remove solvent vapor. No water wash booth is needed.

(4) Heavier films can often be applied, frequently with a higher gloss. In the U.S.A. it is claimed that paint adhesion may be improved.

Standard paints can usually be sprayed with 80% fast and 20% slow solvents, the solvent controlling flow characteristics. Some hot spray formulations have too slow a solvent evaporation rate. Large orifice nozzles are used with heavy-bodied materials. Selection of solvent and spraying temperature are interrelated and there is an optimum temperature for each paint. Typical applications include large parts sprayed on site, enclosed spaces, e.g., tankers, tanks, etc., agricultural machinery, welded structures, e.g., bridges, ships' hulls, railway cars, coaches, motor cars and aircraft.

### *Automatic Spraying:*

*J. Webb* (Aerostyle Ltd.).

Automatic spray machines are of four types:

(1) *The Traverse.* This is the simplest machine, the guns moving across the work on a moving belt conveyor. This is the most reliable method on a flat surface, though it is used also on other work. If the conveyor speed is too fast, triangular gaps remain bare at the sides; if too slow, the same shapes are given a double coating. The greater the fan width and spraying speed, the faster the conveyor or the slower the traverse speed can be. Several coats are applied and the traverser is preferably mounted above a roller type conveyor the guns operating between two rollers. An oven is attached if required. A typical application is silvering mirrors.

(2) *Electronically Timed Single Turntable Semi-Automatics.* The work is mounted on revolving chucks, the gun being adjusted to the right paint volume. An electronic presetting time-switch is operated by a foot pedal and controls a solenoid air valve linked to the guns.

The air motor-driven turntable or the chucks spin during spraying. The whole is enclosed in a booth. The spray pattern is determined for each component. For larger articles two guns are used. Production rates vary from a few hundred to 15,000 articles per day.

(3) *Electronically Timed Batch Turntable Semi-Automatics.* These are similar to the single turntable type except that turntables are detachable for drying after which they are returned to the machines. Production quantities are from 10,000-50,000 per day.

(4) *Spindle Conveyor with Following Spray Equipment.* This is a completely automatic machine, work being loaded, painted, baked and cooled, and unloaded at the other end. A typical machine has paired spindles 4" apart travelling at 8 ft./min. They are carried on two wheel skates and coupled by chain. A sliding gun carriage has a device which engages each spindle and carries the gun forward 3 inches, before moving it back for the next spindle. A trip plate controls spraying time. The other chucks are removable. Overspray is removed from the chucks by brushes in a thinner trough and in a water wash spray booth. Back-spray is cleaned from spray nozzles by spraying thinner at internal guns.

# Finishing Pointers

## Life of Alkaline Cleaning Baths

By J. B. Mohler

A LABORATORY man was once called upon to set a cycle in operation for an automatic plating machine. For the alkaline cleaner he specified a formulation, maintenance of the total alkalinity by simple titration, and dumping of the bath every month. Several years later he was surprised to learn that the original bath was still in use and had never been a source of trouble. The total alkalinity had been controlled within the prescribed limits but the bath had never been dumped.

Periodic dumping of a processing bath is often recommended as "good practice." The above example shows that, in at least this one case, "good practice" was merely a factor of ignorance. If the original recommendation had been followed the bath would have been dumped 24 times. Obviously, the cleaner had a life at least 24 times that anticipated. This is only one example and the history of one bath as applied to a fixed automatic cycle.

On the other side of the coin we have the following well known experience. Trouble with spotty plating or insufficient coverage is encountered at a plating line. All the baths including the cleaner are checked and nothing can be found that is out of line. Nevertheless the cleaner is suspected, so it is dumped. After this is done the trouble disappears. It is such experiences as this that have led to the "good practice" of periodic dumping of cleaners.

A cleaner is often dumped on a periodic basis as the most economical means of avoiding trouble. Now that treatment of dumped wastes is becoming more of a necessity, the economics of prescribed dumping should be re-examined.

The best way to reduce waste treatment costs is to avoid accumulation of the wastes. In many cases this will not apply to alkaline cleaners since alkaline baths may be added to waste acids and, thus, some of the value may be reclaimed by use as a chemical neutralizer. However it is necessary to evaluate the life of alkaline cleaners in order to determine the most economical long range practice for operation of a processing line. How can one determine the life of a cleaner? An obvious answer to this question is to control the cleaner and use it until it no longer cleans satisfactorily. First, let us take a look at the functions of alkaline cleaners and the control factors.

### *Functions and Control Factors*

Alkaline cleaners are used for low cost removal of oil, grease, and dirt from metal surfaces. They function principally to remove organic substances so that the metal will wet completely with further processing solutions. Effective cleaning is an essential step in almost all wet processing methods. However, there are many variations of basic alkaline cleaner formulas to meet a variety of demands for cleaning soils from many different metal surfaces. Whether used as soak or electrolytic cleaners they may be divided into three general categories:

1. Heavy duty cleaners for steel, frequently contain sodium hydroxide and sodium metasilicate. They may also contain trisodium phosphate and sodium carbonate and usually contain some soap or a wetting agent. These cleaners are in the pH range of 12.6 to 13.2.

2. Medium duty cleaners in a pH range of 11.2 to 12.8 contain similar chemicals with the exception of, or with only small amounts, of the stronger alkalis, such as sodium hydroxide and sodium metasilicate. They are used for light duty cleaning of steel or for cleaning of the non-ferrous metals.

3. Light duty cleaners in a pH range of 10.4 to 11.4 are used for light duty cleaning of non-ferrous metals and principally contain the milder alkalis, such as trisodium phosphate or disodium phosphate and sodium carbonate.

Most alkaline cleaners contain soap or a wetting agent, such as a sulfonated petroleum by-product. A cleaner may also contain borates and complex phosphates. Proprietary cleaners are more widely used than formulated cleaners because of services and recommendations made available by vendors of the trade-name products.

Control methods for cleaners are empirical, so that analyses are in terms of ounces per gallon of cleaner rather than as the component chemicals. A single end-point or a double end-point titration is usually made to estimate the effective alkalinity. If sodium hydroxide, phosphates, and carbonates are present, these can be estimated with reasonable accuracy by titration to pH's 10.4, 8.5 and 4.2.[1] If silicates or borates are present, then titrations for available alkalinity may be practical, but are only approximate. In any case, the chemicals that are present must be known or determined in order to make a complete analysis. For many cleaners it is necessary to resort to gravimetric analyses for $P_2O_5$, $Na_2O$, $CO_2$, and $SiO_2$. In addition, it may be necessary to analyze for borates and soaps, so that a complete chemical analysis becomes impractical for routine purposes.

An alternative for complete analytical control is to maintain the bath by a recommended method for technical control and to make occasional cleaner tests. This consists of a standard procedure for measuring the cleaning time for a panel reproducibly contaminated with a standard soil. Many methods of this type have been used to evaluate cleaners, but they have not been applied for control, since it is difficult to produce a standard soil that will represent the production cleaning problem.

A commercial cleaner is accepted by application to a production need. Thus, the real trial is in the processing line or, at least, on a pilot plant basis. Thus, the obvious answer given to our question becomes the practical answer. Technical analyses are used rather than complete chemical analyses.

(*Continued on page* 67)

# Science for Electroplaters

## 26. Waste Disposal

By L. Serota

### *Recovery of Plating Wastes*

IN installations designed for the treatment and recovery of useful material from cyanide and chromate wastes resulting from plating operations, separate recovery systems are used for each type of waste. In one installation, reported by Weisberg and Quinlin, the cyanide unit is based upon the use of a double-effect evaporator for the concentrated rinse obtained from the four-stage counter current rinsing cycle, used on the work coming from a zinc (cyanide) plating tank. The distilled water recovered by this process was recirculated through the rinse tanks; hence none was discharged to waste. Flow through the counter-current rinse was fixed by a regulator, so that the ratio of rinse water was about ten times the volume or weight of plating solution due to drag-out. Another governing factor in this system was the number of rinse tanks used. The small quantity of water required for the rinse method is, indeed, impressive.

Average analyses of the cyanide content (as HCN) indicated an appreciable reduction in concentration for this system. Tank 1, for example, contained 0.286 oz./gal. (2145 ppm.); tank 2, 0.021 oz./gal. (157 ppm.); tank 3, (estimated) 0.0015 oz./gal. (11 ppm.); and tank 4, 0.0007 oz./gal. (5 ppm.) — this being the highest result for several determinations. This last value was attributed to some entrainment in the evaporator. A subsequent chromic acid dip destroyed the small quantity of cyanide carried out of tank 4 by the work. The overall operating cost of this unit, including cost of steam and cooling water, was about 18 cents per pound of recovered sodium cyanide. The unit had a maximum recovery capacity of 160 pounds of sodium cyanide per day.

Recovery of chromic acid from rinse water used in the chromate dipping step, and the chromic acid solution used for producing conversion coatings was accomplished by the ion-exchange process. The cation exchanger containing an oxidation-resistant sulphonic acid type (styrene) resin removed such ions as zinc, trivalent chromium, and iron from the chromic acid solution. The introduction of these sulphonated polystyrene resins eliminated the difficulty previously encountered, owing to the destructive (oxidizing) action that chromic acid had on other resins.

A modified amine ion exchange resin removed the chromic acid from the rinse water in the chromate dipping step. Regeneration of the anion exchange resin with sodium hydroxide removed the chromic acid as sodium chromate. The solution was passed through the cation exchanger again, thereby recovering (by conversion) chromic acid. At the same time, the rinse water was demineralized, thus permitting its re-use.

A significant development in this process was the procedure of sending the chromic acid solution used for conversion coatings through the cation ion exchanger, with favorable results at a solution concentration of 150 g./l. compared to usual 100 g./l., which is the recommended maximum concentration for eluting with this action. This step eliminated additional evaporation, which would become necessary if the solution were diluted (to 100 g./l.). It was also observed that evaporation of the solution in open stainless tanks did not produce a corrosion problem — a condition previously reported, caused by decationized chromic acid.

When the cation exchanger was regenerated, the zinc, trivalent chromium, iron, and sulfuric acid were present in the solution. The solution was neutralized with lime. The metals settled out as oxides and hydroxides, together with calcium sulfate. This was dumped as sludge, and the clear effluent discharged as waste. A saving by this process of about fifteen hundred dollars a month was reported and, of course, elimination of pollution, since neither chromic acid nor cyanide solution in these recovery systems was emptied into the creek.

### *Chromic Anodizing Baths*

At the Rock Island Arsenal, where the first equipment for the treatment of chromic acid anodizing solutions by the cation exchange system with styrene resins was installed (1951), analysis showed that 99.8 per cent of aluminum, 99.5 per cent of iron and 94.8 per cent of trivalent chromium were removed. D. Milne reported the removal of chromium from rinse waters by the ion-exchange process in a pilot plant unit at one of the General Motors Division plants. The suggested treatment of the recovered chromic acid from the regenerated resin is by conversion to barium chromate, a useful pigment in the paint industry.

A comparative cost balance for disposal of chromate waste by chemical treatment and recovery of chromic acid by the ion exchange process, studied at the anodizing plant of a leading aircraft manufacturer on the East Coast, was reported by C. F. Paulson. The graph, Fig. 131, indicates that a conventional treatment plant, including storage, reduction of chromate, and neutralization, would cost several times the price of recovery equipment. In addition, the operating cost of chemicals for this treatment would be in excess of $20.00 per day plus the cost of the operator. The recovery equipment, it was implied, may be installed in the plating room and operated so that no labor cost would be involved. The complete operating cost for the recovery system (of chromic acid) at this plant, is approximately $14.00 a day. The claim is also made that a

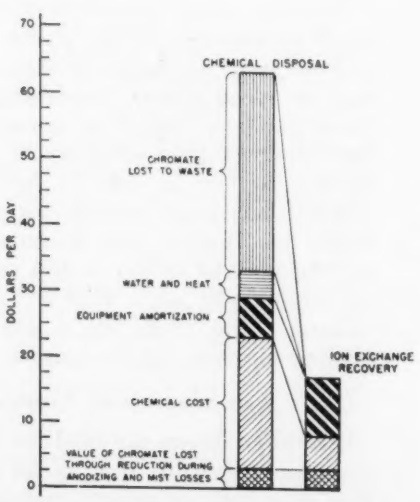



Figure 131.

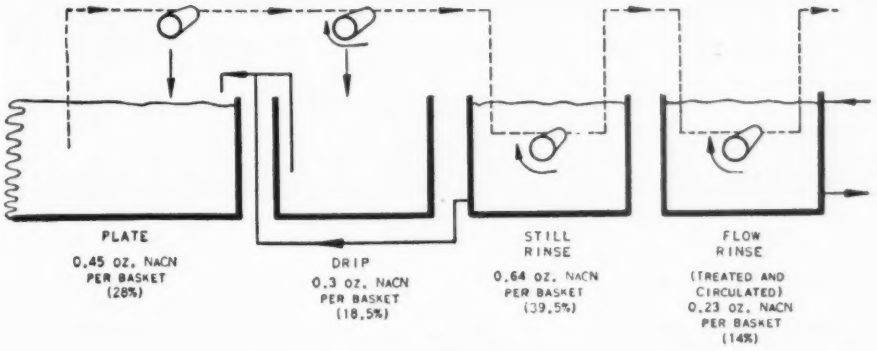



Figure 132.

constant $CrO_3$ content is attained, and a closely controlled pH, permitting more effective operation of the anodizing bath.

### *Silver, Zinc and Copper Treatment*

Recovery of silver from the treatment of dilute silver-bearing cyanide waste at a silverware plant, was described by B. F. Dodge and C. A. Walker. The method entails oxidation of the cyanide with sodium hypochlorite and the simultaneous precipitation of silver chloride. The difficulty of settling, because of the finely divided form of silver chloride, was reduced by carrying out the oxidation process in the presence of silver chloride from previous batches. This procedure served to favor particle growth (seeding) instead of new crystal formation. The report indicated a 99 per cent recovery of the silver in the raw waste. The heavy metals are precipitated as hydroxides by the addition of lime.

Reclaiming of zinc plating solutions in a barrel plating process was accomplished at one plant by introducing an empty (recovery) tank between the plating bath and the rinse tank, Fig. 132. The accumulated concentrated plating solution in this tank was returned (pumped) to the plating tank at regular intervals. This improvement reduced the loss of cyanide (expressed as sodium cyanide) to the sewer, per basket, from 1.62 to 0.23 oz., a recovery of 86 per cent of the cyanide formerly wasted. On the material balance side, 28 per cent of the concentrated solution is returned to the tank directly; 18.5 per cent represents the drainage in the empty recovery tank following the bath; 39.5 per cent is retained by the still rinse (a total of 86 per cent); leaving 14 per cent of the cyanide solution lost in the final rinse. This cyanide waste is decomposed by chlorination.

Copper is recovered for re-use, from a dilute wash water waste from the pickling and bright dipping of brass. Sulfuric acid, copper, zinc, chromate, and trivalent chromium comprise the principal constituents in this waste. The waste liquor, previously filtered and treated with sulfur dioxide for partial reduction of the chromate ion, flows over beds of brass chips, where copper is plated out and the chromium reduction is completed. In a twenty month period, one plant reported treatment of 1,500,000 gallons of waste liquor in this manner.

### *Process Modifications*

An approach to the waste disposal problem that is receiving consideration, from the long-range point of view, is that of modification or substitution of a process or some stage of an existing operation. The favorable aspect of this plan is the elimination of liquid wastes (and cost of waste treatment installations) or producing wastes that are not objectionable. J. E. Copper, for example, suggested the possible utilization of the relatively non-toxic metal pyrophosphate salts as a substitute for metal cyanides (copper-zinc) in plating solutions as a means of reducing the cyanide waste problem. One plant found that an acid-copper plating bath could be substituted for the copper cyanide bath previously used.

Another of this same company's plants eliminated a waste problem by converting a sulfuric acid pickling unit to a phosphoric acid cycle followed by a deionization step using a sulfonated polystyrene resin. Although the cost of the phosphoric acid pickling process, including the deionization unit, was somewhat higher than the sulfuric acid method, the overall advantages favored the change. Equipment problems and rusting of iron after the sulfuric acid pickling were some of the difficulties previously encountered, whereas the metal received a protective (passive) phosphate coating by the new process and the structural part of the building was free from corrosion due to acid fumes. The ion exchange cycle removed from the phosphoric acid pickling baths the ferrous iron, which would otherwise accumulate and interfere with the pickling process by forming insoluble ferric phosphate. The iron must be retained in the (reduced) ferrous state for removal by the exchange resin. This continuous operation conserved the acid.

### *Descaling Processes*

The elimination of acid waste (containing metal ions) in a pickling operation can be accomplished by a descaling process using either molten caustic soda or the proprietary process which includes sodium hydride, NaH. The alkaline waste (NaOH) is not as objectionable as the acid. Descaling entails immersion for about 15 minutes in the hydride bath, which consists of molten caustic soda. (750°F.) and 0.75 to 2.5 per cent sodium hydride. Subsequent quenching in water, resulting in the formation of steam, removes any powdery residue remaining after the removal (by reduction) of most of the metallic oxides by the hydride bath. The work is usually given a sulfuric acid dip after the quenching. The equation for the iron scale reaction is as follows: $Fe_3O_4 + 4NaH \rightarrow 3Fe + 4NaOH$.

Alkaline electroyltic descaling methods are being introduced with patented processes for these derusting procedures. The solutions of alkaline salts are electrolyzed, in steel tanks, with the work to be descaled made cathodic.

Another descaling process is the replacement of chemical treatment by a mechanical (abrasive) process. This procedure, incorporating the use of abrasive or shot cleaning, was tried as a substitute for acid pickling at one plant. The results indicated a reduction in overall cleaning cost of approximately one half of that required by the acid cleaning method. Difficulties are introduced, such as cleaning, from the inside of a hole or machining, the embedded scale resulting from the impact of the abrasive. The view held, however, was that the defects en-

countered were not sufficient to affect this method of operation seriously.

Metal plating from carbonyl gases presents a promising development for the not too distant future. In addition to elimination of liquid plating wastes, this process, it is claimed, is faster than the electrolytic method; provides better reproduction of irregular surfaces; and can be applied directly to non-conductors that can withstand temperatures of 400°F. In a process reported for nickel (gas) plating, a nickel deposition of 13 lbs., 6 oz. on a small table top during a 60 minute plating cycle, and a plating operation requiring 30 minutes by the electrolytic process, was duplicated by this method in 4 seconds. The process is adaptable for continuous operation. The disadvantages are the toxicity of both the nickel carbonyl vapor and the liberated carbon monoxide. A gas-tight unit and burning of the waste gases must be considered. Then too, since nickel carbonyl is a strong reducing agent, the danger of explosion when mixed with oxygen is introduced. The unit must, therefore, be flushed with inert gases to avoid this danger. The equation for the deposition of nickel from nickel carbonyl, $Ni(CO)_4$ at 356°F. is as follows: $Ni(CO)_4 \rightarrow Ni + 4CO$. Iron, chromium, tungsten, and molybdenum have also been applied to basis metals by this method.

### *Lagoons*

One of the simpler and cheaper methods of eliminating industrial wastes, including oil emulsions, acid wastes, and alkaline wastes, is the use, where space permits, of the lagoon system; a process depending upon seepage and evaporation. Although its application to disposal of toxic wastes, especially cyanide waste, because of possible contamination of water systems, is questionable and is being ruled out in many areas, the ponding (lagoon) system for waste treatment has been preferred at some plants because it offered a complete treatment, including reduction of turbidity, oil, solids, and biochemical oxygen demand. In addition, proper alkalinity, pH, and dissolved oxygen content are provided at a minimum cost. Analytical data collected during operation of one multiple basin system, including plating room wastes (silver, copper, chromium, tin) gave a most satisfactory effluent which was discharged over a concrete weir to a small creek. The toxic wastes from the plating room were treated chemically and the non-toxic wastes, such as cleaning solutions, acid and rinse tanks were clarified in the lagoons.

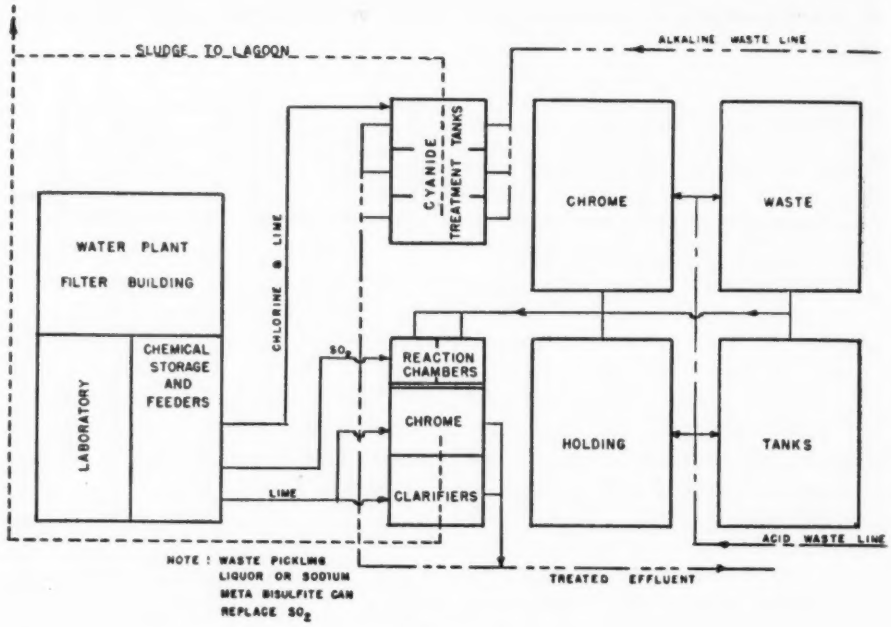



Figure 133.

A striking example of the use of lagoons in waste disposal treatment plants is the installations at the Willow Run and Monroe, Mich. plants of the Ford Motor Co. Chromium waste at the Willow Run plant was reduced, at pH of 2.5-3.0, with ferrous sulfate and neutralized with lime. Hexavalent chromium, after treatment, was reported to be absent from the effluent. The sludge which was pumped to the lagoon from the settling basis was light, and did not compact too well, and the solid content of the slurry pumped to the lagoons was as low as 0.5 per cent solids by weight.

The unit at the Monroe plant included a combined water-softening and plating waste treatment plant. This installation, one of the largest of its type in the world, was equipped to treat 800 gallons per minute of acid wastes containing chromium, nickel, etc., and 300 gallons per minute of cyanide wastes. Acid waste was collected in four 200,000 gallon acid proof concrete tanks. Treatment consisted in adding ferrous sulfate, sodium metabisulfate or sulfur dioxide as needed, and neutralizing with lime. Sludge settled out in a clarifier unit, and was pumped to a lagoon. The effluent was sent to the sewer. The cyanide waste was collected in three 20,000 gallon tanks and treated with chlorine and lime. The sludge was pumped to a lagoon and the treated effluent sent to the sewer. Fig. 133 is the flow sheet for the complete unit.

Waste treatment at the Douglas Aircraft plant represents another example of the use of lagoons in installations equipped for waste disposal from plating shops. Acid waste, including hexavalent chromium was reduced with sulfur dioxide at a pH of 2.5 to the trivalent form, and the cyanide waste was oxidized to cyanates with chlorine at a pH of 9.0. The metal ions in the combined treated wastes were then precipitated with lime and separated from the effluent in a sludge settling unit. The effluent was discharged into a tributary of the Arkansas River, and the sludge pumped to a lagoon. Control units at critical steps regulated the operation of this process. The installation was capable of handling a combined flow of 750 gallons per minute (1500 pounds cyanide, 2000 pounds hexavalent chromium per day).

A report of Orsanco (1953) on metal finishing wastes adds to the view that detention and dewatering of the sludge by lagooning, where space permits, is recognized at the present time as the most generally accepted method for disposal of sludge. The supernatant liquor can be discharged to a stream, the report emphasizes, if accepted previous treatment processes and precautions for the waste were observed. Periodic, analytical procedures for the clarified liquor are usually followed as a control measure.

# SHOP PROBLEMS

ABRASIVE METHODS SURFACE TREATMENTS CONTROL
ELECTROPLATING CLEANING PICKLING TESTING

**METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.**

### Plating on Titanium

*Question:* In view of the conflicting data on the subject, we should greatly appreciate it if you would clarify whether or not it is possible to apply electroless nickel, or even electroplated nickel, to titanium. Appropriate formulae would be appreciated, particularly with regard to surface treatment.

D. L. D.

*Answer:* There have been some reports recently of successful processes for plating on titanium but no details have been disclosed. The only suggested method in our files is a dip in concentrated hydrochloric acid at 90 deg. C. to boiling, disclosed in a patent granted to S. Hands (U. S. Pat. No. 2,734,837. Feb. 14, 1956).

We have no record of application of electroless nickel to titanium. However, the problem would be that of adhesion rather than deposition, since the catalytic plating process will deposit nickel even on non-conductors. Details on the electroless process will be found in the latest edition of the METAL FINISHING GUIDEBOOK.

### Coating to Resist Molten Aluminum

*Question:* We are interested in obtaining a heavy iron oxide coating on steel that would be reasonably resistant to solution in molten aluminum. Information would be appreciated regarding the value of this surface treatment and where we could have it done.

E. J. M.

*Answer:* The common coating processes will not produce a heavy oxide coating on steel and, in addition, if you were to obtain a heavy oxide by some other means, you would have the problem of spalling due to temperature changes and the difference in coefficient of expansion of metal and oxide.

It is suggested that chromium diffusion coatings be investigated for the purpose.

### Silver Strike

*Question:* Silver strike solutions in your 1956 GUIDEBOOK, page 348, call for sodium cyanide. Can potassium cyanide be substituted satisfactorily? I realize it is generally more expensive, but understand that it is safer to use from the point of view of dangerous fumes. If so, would it be the same proportions?

T. A. C.

*Answer:* Potassium cyanide solutions are considered preferable to sodium cyanide formulations because of the smoother finish obtained and the elimination of carbonate precipitation in cold weather. One-third more of potassium cyanide is used in every case than sodium cyanide.

There would be no advantage, however, in employing the potassium salt in the strike unless potassium cyanide is used in the plating solution also. In the latter case, articles can be transferred from strike to plate without intermediate rinsing.

No dangerous fumes are evolved with use of either salt.

### "Eloxal" Finish

*Question:* I received a letter from a European friend of mine, telling me that certain jewelry, that is made by the "Eloxide" treatment, is popular in Europe, and asking whether I could send him a few pieces that had been made by this process. I tried to get some information in the stores but they don't know anything about "Eloxide" treatment. My friend also wants to know information about the process, but I believe I could not get this information from the store-keepers.

My question is simply this: first, how can I be sure that the object I buy in the jewelry store is made by the "Eloxide" treatment? Or how can the store-keeper be sure—how can he identify his jewelry? Second, which store sells "Eloxide" process jewelry in Toledo? Third, how could I get production information abou the process?

M. K.

*Answer:* The Eloxide or Eloxal process is an anodizing treatment for aluminum employing an oxalic acid electrolyte. The process is not common in this country and any jewelry obtained in the stores will more probably have been finished in the sulfuric acid anodizing bath. However, the process used will make very little difference in the finished product. There is no simple method of determining which of these two processes have been employed by the manufacturer.

In formation on the Eloxal process will be found in the book, "The Surface Treatment and Finishing of Aluminium and Its Alloys" by S. Wernick and R. Pinner. Details will also be found in the Sept., Oct., and Nov. 1955 issues of METAL FINISHING.

### Barrel Copper-Nickel-Chromium Plating

*Question:* We wish to copper, nickel and chromium plate small zinc die castings in barrels. We are all set on the barrel chromium solution, but are somewhat in the dark about the barrel copper and nickel solutions which will take barrel chrome successfully. Can you help us?

E. F. D.

*Answer:* Any cyanide copper solution can be employed for plating zinc base die castings in a barrel. Sufficent thickness of deposit should be applied to allow for subsequent ball burnishing and to prevent immersion plating in

the barrel nickel solution, which would result in black streaks.

Standard barrel nickel formulations will be suitable, if a copper base is applied. However, if bright nickel deposits are required, there may be trouble due to production of a laminated nickel during barrel plating, which will peel when chromium plated. It may be necessary to make trial runs with different brighteners and in both horizontal and oblique plating barrels to determine which will give best results.

### Plating Specifications

*Question:* We are very much interested in securing a book containing all the military and automobile industry plating specifications, and are wondering if you would be able to tell us where we might secure one.

C. J. B.

*Answer:* You can obtain the Index of Federal Specifications and Standards from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. at $1.75, which includes cumulative supplements, as issued. You can then choose those specifications in which you are interested.

There is no published listing of automobile industry specifications. Each company has its own set which is furnished to subcontractors.

### Hydrogen Embrittlement

*Question:* My problem is a plated $\frac{5}{16}$" diameter screw. After plating, this screw does not meet requirements with the torque wrench foot pound strength, as the same screw strength before plating. To overcome this hydrogen embrittlement, I would like to know at what temperature these should be baked and how long. Does this hydrogen embrittlement disappear in time with no baking?

O. A. J.

*Answer:* Federal specifications call for baking at 350-400 deg. F. for 3 hours to relieve hydrogen embrittlement of all parts having a hardness greater than Rockwell C-40. If supplementary coatings such as chromate and phosphate conversion films are applied on cadmium and zinc plate, baking should precede the application of the supplementary coatings.

Embrittlement relief at room temperature is considered to be much too slow to be effective.

### Chromium Direct on Steel

*Question:* I would like your opinion on direct chromium plating our steel display fixtures, to avoid copper or nickel plating.

C. H. A.

*Answer:* Chromium can be applied directly to steel but, to produce an ornamental finish, the deposit must be sufficiently heavy to withstand a buffing operation, which would mean a thickness of at least 0.0003". The standard sulfate bath operated at about 160 deg. F. will produce a suitable deposit for buffing and without any tendency to crack.

The equipment requirements for this type of production are large and marks in the steel cannot be flowed over during buffing of chromium. A more economical procedure would be to copper plate and buff the copper. A bright nickel plate and final thin chromium deposit would then follow.

### Plating on Stainless Steel

*Question:* The Stainless Steel section of your 1956 GUIDEBOOK states that cathodic treatment in hydrochloric acid is a patented process. We would appreciate it if you can send us the patent number.

A. S. B.

*Answer:* Patent No. 2,133,996 discloses the cathodic treatment of stainless steel at 20 amp./sq./ft. in a 5-50% hydrochloric acid solution at room temperature, to insure adhesion of subsequent deposits.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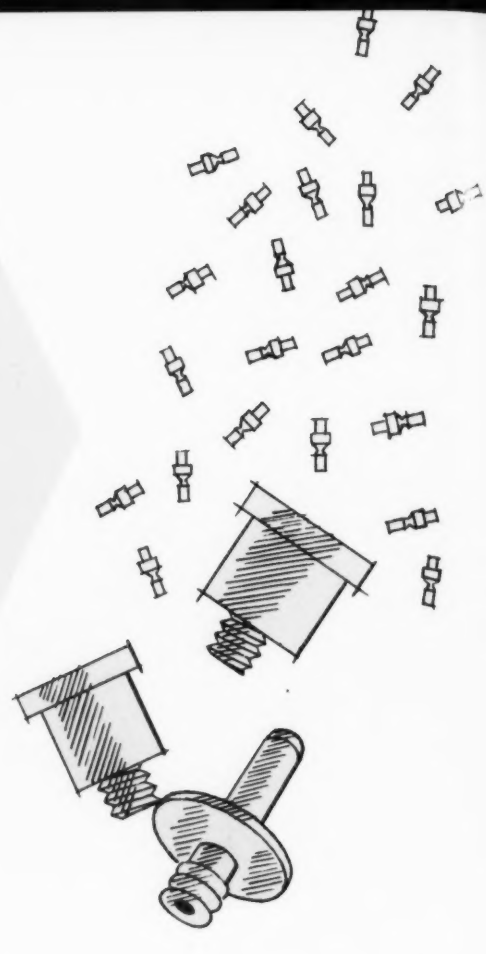

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# Patents

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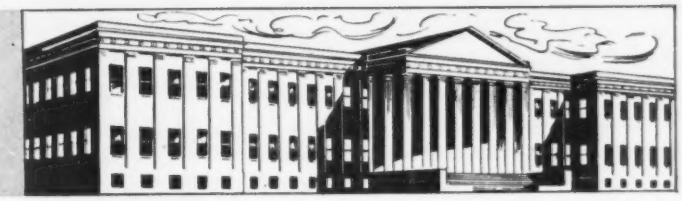

### Anti-Rust Oils

*U. S. Patent* 2,771,371. *Nov.* 20, 1956. *E. A. Dieman and P. H. Ravenscroft, assignors to Standard Oil Co.*

A composition for preventing rust formation on ferrous metal surfaces which are normally exposed to atmospheric air and moisture, which composition consists essentially of a phenol extract of a petroleum oil of lubricating oil viscosity, from about 1% to about 30% of mahogany soap, and from about 1% to about 10% of a mixture of saturated aliphatic oxygen containing compounds including alkyl esters, lactones, ketones, alcohols, and alcohol ketones, said saturated aliphatic oxygen containing compounds being obtained by the partial oxidation of petroleum hydrocarbons.

### Abrasive Blasting Machine

*U. S. Patent* 2,771,189. *Nov.* 20, 1956. *A. J. Kriz, assignor to Pangborn Corp.*

In a work blasting apparatus, a recycling system for collecting particles resulting from a blasting operation, separating re-usable blastant particles from non-reusable particles, removing the non-reusable particles, and returning the blastant particles to a blasting position where they are again available for use in a blasting operation.

### Coating Tin Surfaces

*U. S. Patent* 2,771,410. *Nov.* 20, 1956. *J. J. Russell and H. N. Headland, assignors to Ekco Products Co.*

In the formation of a heat absorbing tin oxide coating on a tin surface article, the process which comprises subjecting the tin article to anodic electrolytic treatment in an aqueous alkaline electrolyte consisting of about 1.5% to 12% by weight disodium hydrogen phosphate and about 1.5% to 12% by weight boric acid, passing current through said electrolyte to form an oxide of tin, removing the oxidized tin article from the electrolyte and then subjecting the anodized article to an elevated temperature from about 180°C. to 230°C. to convert said oxide to green oxide of tin.

### Electroplated Bearings

*U. S. Patent* 2,771,409. *Nov.* 20, 1956. *C. T. Cross, assignor to General Motors Corp.*

A method of forming a grid bearing which comprises the steps of depositing silver onto a backing member, applying a thin coating of tin to the silver, forming a tin-silver alloy diffusion zone by heat treatment, die forming a multiplicity of grid pits in the resulting surface, filling said grid pits with a soft bearing material, and thereafter removing a portion of said diffusion zone and soft bearing material.

### Electroforming Apparatus

*U. S. Patent* 2,771,415. *Nov.* 20, 1956. *A. O. Ross, assignor to The National Electroform Mold Co.*

An electrolytic apparatus for electroforming of a metal product, comprising, a tray for containing an electrolyte, a sump for containing excess electrolyte, conduit means located between said sump and tray, means for pumping said electrolyte through said conduit means, nozzle means cooperating with said conduit means for continuously and uniformly introducing said electrolyte into said tray from the top thereof, an electric circuit including an anode element and a cathode contact element, a source of electric power for said circuit, and a non-conducting basket arrangement for containing the metal to be electrodeposited to form said metal product, said arrangement including at least top and bottom sections, a first pin means for holding said sections together, said top section including at least two spaced sidewals, said bottom section being formed of spaced members arranged in alignment with said sidewalls of said top section, said members defining a space for accommodating said cathode contact element and the product to be electroformed, said top section having a plurality of spaced truss members for interconnecting said sidewalls, a second pin means positioned on said top section, and screening means supported by said second pin means and resting against said plurality of spaced truss members, said anode element being positioned on top of said screening means and arranged to support the metal to be electrodeposited, said screening means being utilized to screen impurities from the electrolyte during the electroforming of said metal product.

### Purification of Cyanide Solutions

*U. S. Patent* 2,771,411. *Nov.* 20, 1956. *A. E. Chester and J. T. Irwin, assignors to Poor & Co.*

A method for electroplating metal from a by-product aqueous alkaline cyanide solution derived by absorbing coke oven gases in an aqueous alkaline solution, to produce an electrodeposited plate free from stain and porosity, which comprises first subjecting such a by-product solution containing as produced detrimental organic substances and sulfur, including organically combined sulfur, to treatment with an oxidizing compound selected from the group consisting of peroxides, hypochlorites and permanganates to oxidize sulfurous substances, passing the resulting solution through a filter cake containing activated carbon, thereby removing detrimental substances from said by-product solution, providing a metal platable from an alkaline cyanide bath in the resulting purified by-product solution in a soluble form, and electroplating said metal from the resulting plating solution.

### Purification of Cyanide Solutions

*U. S. Patent* 2,771,412. *Nov.* 20, 1956. *A. E. Chester and J. T. Erwin, assignors to Poor & Co.*

A method for electroplating metal from a by-product aqueous alkaline cyanide solution derived by absorbing coke oven gases in an aqueous alkaline solution, to produce an electrode-

posited plate free from stain and porosity, which comprises first subjecting such a by-product solution containing as produced detrimental organic substances and sulfur, including organically combined sulfur, to treatment with an alkali soluble inorganic compound of a metal selected from the group consisting of lead, copper, cadmium, and bismuth to precipitate sulfurous substances, passing the resulting solution through a filter cake containing activated carbon, thereby removing detrimental substances from said by-product solution, providing a metal platable from an alkaline cyanide bath in the resulting purified by-product solution in a soluble form, and electroplating said metal from the resulting plating solution.

### Gas Plating

*U. S. Patent* 2,771,669. *Nov.* 27, 1956. *J. W. Armstrong, R. W. Spears and R. D. Williams, assignors to General Motors Corp.*

In the manufacture of steel tubing which is formed continuously from a flat steel strip by bending the strip into tubular form and welding the abutting edges of the tube as it is continuously moved past a welding device; the method of coating the interior surface of the tubing during its continuous formation and while it is being moved continuously with a non-corrosive metal such as zinc which comprises the steps of introducing particles of said metal into the tubing before the tubing is fully formed and while it is below welding temperature, introducing a non-oxidizing gas into the tube after it is fully formed and welded, subsequently heating the tube sufficiently to vaporize the coating metal, and thereafter cooling the tubing to effect condensation of the vaporized metal on the surface of the tubing.

### Corrosion Resistant Tank

*U. S. Patent* 2,771,985. *Nov.* 27, 1956. *R. B. Seymour, assignor to The Atlas Mineral Products Co.*

A structure adapted to contain corrosive fluids comprising an inner synthetic resin wall having a thickness of from about 5 to about 100 mils, an outer synthetic resin wall having a thickness of from about 5 to 100 mils and spaced from said inner wall a distance of from about 1/8" to about

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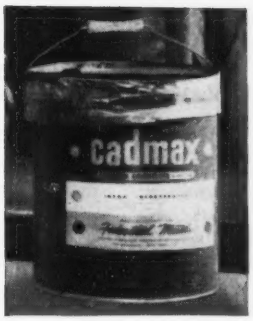


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2.5" and sulfur between said inner and outer walls.

### Immersion Nickel Plating

*U. S. Patent* 2,772,183. *Nov.* 27, 1956. *P. Talmey, D. E. Metheny and W. G. Lee, assignors to General American Transportation Corp.*

The process of plating with nickel the surface of a body formed essentially of iron, which comprises cleaning and degreasing the surface of said body, soaking said body in an aqueous solution of hydrogen peroxide for a time interval sufficiently long to form only a thin iron oxide film upon the surface thereof and without the formation of any visible rust upon the surface thereof, said solution containing not in excess of about 0.1% by weight of hydrogen peroxide, and then contacting said body with a nickel plating bath of an aqueous solution of a nickel salt in order to effect the displacement deposit of a thin nickel film upon the surface of said body.

### Porcelain Enameling

*U. S. Patent* 2,772,187. *Nov.* 27, 1956. *J. M. Katz, E. Hurst and A. Jakubczak, assignors to General Ceramics Corp.*

In the process of enameling metal surfaces the steps comprising providing a porcelain enamel slip comprising water as a suspending medium, adding oxgall to the slip, applying a thin layer of the slip to a cleaned metal surface to be enameled and drying and firing said coated product whereby to produce a porcelain enameled metal which is substantially free from the defects of run-off, shiners and blabs.

### Gas Plating

*U. S. Patent* 2,772,985. *Dec.* 4, 1956. *E. Wainer, assignor to Thompson Products, Inc.*

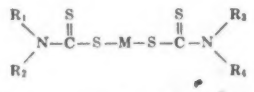
The method of providing a corrosion resistant surface on a molybdenum article which comprises depositing a layer of aluminum on said article, and thereafter reacting the resulting coated article with an element selected from the group consisting of boron, silicon, titanium, and zirconium.

### Bright Copper Bath

*U. S. Patent* 2,773,022. *Dec.* 4, 1956. *D. R. Turner, assignor to Westinghouse Electric Corp.*

An aqueous electroplating electrolyte for plating bright or semi-bright copper as the sole metal to be plated,

the electrolyte comprising an aqueous solution of a copper salt having admixed therein from .0005 to 1.0 ounce per gallon of a brightening agent having the nucleus.



where M is a metal selected from the group consisting of cadmium, cobalt, nickel, and zinc and $R_1$, $R_2$, $R_3$, $R_4$ are selected from at least one of the group consisting of monovalent hydrocarbon radicals containing from 1 to 6 carbon atoms.

### Drum-Type Pickler

*U. S. Patent* 2,772,523. *Dec.* 4, 1956. *O. Ruthner.*

A drum-type pickling plant comprising a series of tanks filled with treating liquid, a drum having an apertured shell and rotatable about a horizontal axis, which drum can be lowered into the tanks, supporting and drive rollers for supporting and rotating the said drum, a gate-like frame movable over the series of tanks, a cross-spar which can be lifted and lowered within the said frame, and bearings slidable on said cross-spar for carrying the said supporting and drive rollers for the drum.

### Abrasive Blasting

*U. S. Patent* 2,773,339. *Dec.* 11, 1956. *F. N. Bischoff and H. P. Haberlin, assignors to Georg Fischer Aktiengesellschaft.*

In the process of blast-treating shapes, castings and the like; the step of directing against the surface of the casting made of light weight metal with an atomic weight ranging from 24 to 27 shots, grits, slugs and like particles obtained from an alloy of light weight metal consisting predominantly of aluminum in an amount not less than approximately 80% of the total weight of said alloy.

### Chromate Conversion Coating

*U. S. Patent* 2,773,623. *Dec.* 11, 1956. *L. K. Schuster and A. L. Baldi, Jr.; assignors to Heintz Mfg. Co.*

Plain carbon steel having its surface covered with an in situ formed adherent protective iron oxide surface film, the film being coated with an in situ formed combination of hydrated chromium oxides containing about 20 to 60% chromium by weight, about 40 to 95% of the chromium by weight being trivalent, the remainder being hexavalent, and the coating weighing about 10 to 200 milligrams per square foot of surface that it covers.

### Alkaline Nickel Plating Solution

*U. S. Patent* 2,773,818. *Dec.* 11, 1956. *P. W. Moy and A. H. Du Rose, assignors to The Harshaw Chemical Co.*

An aqueous, alkaline nickel plating solution comprising a nickel compound of the class consisting of nickel chloride, nickel sulfate and mixtures thereof molecularly equivalent to 75 to 250 grams per liter of nickel sulfate hexahydrate, a complexing agent in concentration from 25 to 175 grams per liter, said complexing agent being a polyalkanoic acid derivative of a polyalkylene amine soluble in the solution, and a polyalkanol amine stabilizer present in concentration from 25 to 200 grams per liter, the pH of said solution being in the range from 6.5 to 12.

### Electrodeposition of Lead

*U. S. Patent* 2,773,819. *Dec.* 11, 1956. *L. Gianelos, assignor to The Harshaw Chemical Co.*

A lead fluborate plating solution containing lead fluoborate, fluoboric acid and cooperating addition agents in amount sufficient to increase the covering power and suppress the formation of trees, one of said addition agents being aloin and the other thereof being dibenzene sulfonamide.

### Electropolishing Bath

*U. S. Patent* 2,773,821. *Dec.* 11, 1956. *G. H. Smith, assignor to Electro-Gleam, Inc.*

A solution for use in electropolishing metals of a group consisting of iron, aluminum, nickel and alloys thereof, said solution containing from 30 to 40 per cent of orthophosphoric acid, 25 to 35 per cent of sulphuric acid and 10 to 20 per cent of hydroxyacetic acid, 5 to 25 per cent of benzene sulphonic acid, 2 to 12 per cent of toluene sulphonic acid and from 5 to 10 per cent of water.

### Device for Washing and Drying Bearings and the Like

*U. S. Patent* 2,774,362. *Dec.* 18, 1956. *J. R. Nordling.*

A device for cleaning bearings and the like comprising a reservoir tank for cleaning fluid, a compressed air supply pipe connected with said tank for pressurizing said fluid, a washing chamber having a rotatable support for parts to be washed, nozzle means at one side of said support connected with said tank and directed tangentially toward said support and parts supported thereby to wash and rotate said parts by the action of jets of cleaning fluid from said nozzle means, and a nozzle at one side of said support connected with said air supply pipe and directed tangentially toward said support and parts supported thereby to dry and rotate said parts by the action of an air jet from said nozzle.

### Cyanide Reduction

*U. S. Patent* 2,773,025. *Dec.* 4, 1956. *H. E. Ricks and W. M. Trigg, assignors to Westinghouse Electric Corp.*

In the process of rapidly reducing to a low concentration the cyanide content of an aqueous solution of a cyanide, the steps comprising disposing in the aqueous solution an inert cathode and an insoluble anode having porous walls, passing through the walls of the porous anode a gas containing free oxygen, the gas forming a stream of fine bubbles at the surface of the anode, and, simultaneously with the passage of the gas through the walls of the anode, passing a direct electrical current at a density of at least 5 amperes per square foot at the anode, the amount of the gas being sufficient to provide oxygen in an amount in substantial excess of that required to react with the cyanide to form relatively non-toxic products comprising essentially carbon dioxide, carbon monoxide, and nitrogen.

### Current Collector for Rotary Shafts

*U. S. Patent* 2,773,247. *Dec.* 4, 1956. *J. E. Erhardt, Jr. ,assignor to Crown Cork & Seal Co., Inc.*

In apparatus having a current roll for electro-plating and the like, a shaft extending from the current roll at one end thereof, a bearing having a cap portion for rotatably supporting the shaft, a current transfer device frame supported by the bearing, a cylindrical current transfer shoe supported on the shaft, a plurality of brushes mounted on the frame and positioned to ride against the cylindrical surface of the current transfer shoe, the transfer shoe being supported on the shaft by means of a split coupling, one portion of the split coupling being removable from engagement with the shoe

and shaft to permit movement of the shaft away from the shoe in a direction transverse to the axis of the shoe.

### Rack for Cooling Freshly Galvanized Pipe

*U. S. Patent* 2,774,459. *Dec.* 18, 1956. *O. R. Olson.*

A rack for cooling lengths of freshly galvanized pipe sections which comprises, a frame with upper and lower track levels and a transfer therebetween at one end, a pipe receiving station on the upper track level and a pipe discharge station on the lower track level at the opposite end of said frame from said transfer, conveyor means along said track levels having spaced abutments to shove separated pipe sections from the receiving to the discharge station and causing the pipe sections to rotate due to their frictional contact with the track to maintain a uniform distribution of the galvanize before it cools and hardens.

### Porcelain Enameling

*U. S. Patent* 2,774,678. *Dec.* 18, 1956. *C. J. Rodman, assignor to Alliance-Ware, Inc.*

The process which comprises working the surface of an iron sheet product by bombarding it with relatively fine metallic shot, the shot being high in the scale of hardness compared to the iron sheet, whereby the worked surface is covered with pock marks, and then porcelain-enameling the surface.

### Plating on Magnesium

*U. S. Patent* 2,774,683. *Dec.* 18, 1956. *H. K. De Long, assignor to The Dow Chemical Co.*

In a method of treating the surface of an article of magnesium and the magnesium base alloys containing at least 85 per cent of magnesium so as to render the surface receptive to electrodeposition of a uniform adherent plating of nickel, the steps which consist in subjecting the article to the action of an aqueous solution containing from 30 to 100 grams of copper sulfate ($CuSO_4$) and from 6 to 30 grams of chromium trioxide ($CrO_3$) per liter the pH of the solution being from 2 to 6, so as to form a copper containing coating on the article, rinsing the so treated artcle in water, and then subjecting the article to the action of an aqueous acid fluoride solution containing from about 17 to 280 grams of HF per liter of solution.

### Porcelain Enameling

*U. S. Patent* 2,774,681. *Dec.* 18, 1956. *P. Huppert and A. F. Jakubczak, assignors to General Ceramics Corp.*

In the process of providing a metal article with a high temperature resistant coating the steps comprising coating said metal object with a slip of a high temperature resistant, ceramically maturable vitreous enamel composition, incorporating mica particles into the surface region of the coating of the thus coated metal object prior to completing the drying of the applied slip, drying the slip and firing the ceramic composition at a temperature of the order of 50°F. higher than the normal maturing temperature of such ceramic composition whereby to provide a vitreous enamel coating containing mica particles at least partially embedded therein.

### Hot Dip Aluminum Coating Process

*U. S. Patent* 2,774,686. *Dec.* 18, 1956. *A. W. Hodge, assignor to Kaiser Aluminum & Chemical Corp.*

In the art of hot dip coating of basis metals with a metal selected from the group consisting of aluminum and its alloys, the improvement which comprises introducing alkali metal into a bath of a molten metal selected from the group consisting of aluminum and its alloys and wherein no protective atmosphere is employed over said bath, and passing said basis metal through the melt to provide said basis metal with a coating of said molten metal, the alkali metal being at least one metal selected from the group consisting of sodium, potassium and mixtures thereof and being introduced in a minor amount sufficient to enable said basis metal to be coated at a faster rate and the resulting coating to be complete, even and smooth as compared to a similar bath which has not been treated with said alkali metal, and to increase drainage and to extend bath life.

### Electroless Nickel

*U. S. Patent* 2,774,688. *Dec.* 18, 1956. *R. J. Girard.*

A method for nickel plating by chemical reduction comprising the step of immersing a metal article from the group consisting of iron, platinum, silver, gold, copper, palladium, brass, bronze and titanium into a controlled nickel sulphate solution including the following constituents in the following amounts per litre, nickel sulphate about 30 grams/l., sodium hypophosphite about 24 grams/l., sodium acetate about 12 grams/l., boric acid about 8 grams/l., and ammonium chloride about 6 grams/l., at a temperature of between 196°F. and 204°F.

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## FINISHING POINTERS

(*Continued from page* 57)

### *Cleaner Life*

The life of a cleaner is best determined by observation of results in an actual application. A log of analysis and performance of the cleaner is most helpful to anticipate and determine the life. One can afford to make an occasional complete chemical analysis to determine the changes in composition with time. Also, the measurements of specific gravity and conductivity have been found useful in some cases, since these are simple, rapid methods. A good log coordinated with observation of the effectiveness of the cleaner will establish the usable life.

If a soap or other wetting agent is essential for good cleaning, then the wetting agent should be maintained by test or observation of the foam blanket on the cleaner.

The cleaner will not lose cleaning power suddenly due to changes in the major chemicals present. Since the cleaning power changes gradually, the loss of cleaning power can be observed over a long period by observing the cleaning time. If the normal cleaning time is one minute, the work should clean in half this time to maintain safe cleaning. A fresh cleaner may clean in ¼ minute. The minimum cleaning time for a fresh cleaner can be estimated by dipping of production parts for various times. This test can be repeated at intervals as the cleaner is used. An increase in cleaning time will indicate unfavorable changes. The log may reveal changes in analysis, practices, or the work that account for this. If the cleaning time gradually increases, then the life of the cleaner will be anticipated by extrapolation to a cleaning time equal to the processing time. This actual condition should be avoided; unless a loss in production time is permissible in order to determine the real life of the cleaner.

### *Reference*

1. Metal Finishing, **46**, 89 (June 1948).

# ABSTRACTS

## Titanium-Coating of Copper Surfaces with Titanium Hydride

P. Lombardi and S. Bordi: *La Metallurgia Italiana*. Vol. 46, p. 221.

The author applied a coating of titanium on a copper surface by the decomposition of titanium hydride at high temperatures, the objective being to obtain an increased hardness of the surface. The procedure and materials used are described, also metallographic and hardness investigations of the surface coatings. In order to increase the surface hardness still further, it is intended to utilize the hardness characteristics of the copper-titanium alloy.

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## Silver Plating from Sulfamate Bath—Preparation of Silver Sulfamate

S. Tajima, Y. Hiratsuka and Y. Kosaka: *Journ. Electrochem. Soc.* of Japan. Vol. 22, p. 211.

In the preparation of silver sulfamate or solutions of same, use is made of the double reaction of $Ag_2SO_4$ and barium sulfamate or silver carbonate and sulfamic acid, but this process takes a long time. The following process is, therefore recommended by the authors:

$$2Ag\,NO_3 + 2NaOH \rightarrow Ag_2O + 2Na\,NO_3 + H_2O$$

$$Ag_2O + 2HSO_3NH_2 \rightarrow 2AgSO_3\,NH_2 + H_2O$$

In addition, it is proposed to dissolve 99.99% silver anodically in sulfamic acid with the use of porous cells, specially provided with an electro-positive anion-exchange membrance, as without this the desired silver concentration cannot be obtained.

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## Plating and Coloring Silver-Plated Fancy Ware

*Metalloberflaeche*. Vol. 7, No. 3, p. 43 B.

Liver of sulfur solution is the means most frequently used in coloring silverware for decorative purposes. If care has to be taken with the parts, if they are of a delicate nature, etc., the coloring is conducted with ammonium sulfide vapors; the parts are hung in a box and a small bowl of yellow ammonium sulfide placed inside on the bottom. The ware discussed comprises largely metallized natural articles, such as leaves, etc. These are first made conductive, then coppered and subsequently silvered. Care must be taken with the copper plate, as this will affect the silver subsequently applied as regards the luster. Thus, the copper from an acid bath is coarsely crystalline, so that it is best to give the parts a light flash in an acid bath after having been made conductive and then to give a stronger copper coating in a cyanide bath, preferably a bright copper bath, and subsequently plate in a bright silver bath.

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## Theory of Chromium Plating

D. Reinkowski and C. A. Knorr: *Zeitschrift fuer Elektrochemie*. Vol. 58, No. 8, p. 709.

The authors first assembled the data which have been obtained by previous research workers in the field of chromium deposition. The picture shows what diagrammatic form the current density-potential curve has when depositing chromium with the addition of foreign anions, for example, sulfate ions. It is recognized that, before the actual separation of the metallic chromium, three other processes have occurred. The first branch (change point) on the curve, which is not found with all metals, corresponds as does the second change point, to the reduction of the chromium from the hexavalent form to the trivalent. If still higher bath voltages are applied, then hydrogen generation is found in the third change point. This, however, occurs only if the hydrogen overvoltage is small on the metal to be plated. If the reverse is the case, then the potential alone is shifted to such non-noble values by the process corresponding to the second change point that, without the special occurrence of hydrogen generation, the process corresponding to the fourth change point, reduction occurs of the hexavalent chromium to trivalent and to metallic chromium respectively. Besides this chromium reduction, there naturally also occurs hydrogen generation.

The most interesting findings made by the authors, applicable to practical conditions, are those located at the fourth change point, at which the metallic chromium begins to separate out. In this reaction, trivalent chromium is also formed, and hydrogen generated. The authors assume that an intermediate compound of divalent chromium is formed. By the reduction of this compound, the metallic chromium is then formed. If the concentration of the foreign anions in the bath is now raised, this intermediate compound forms more rapidly. It is, however, again auto-oxidized by the chromic acid of the electrolyte and, rather naturally, all the more strongly, the more spread-out it is on the cathode surface. In this way the authors explain the mode of formation of the known current efficiency maximum in chromium plating. This maximum lies, for example, for sulfuric acid, at 1.5% calculated on the chromic acid content.

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## Boehmite Coatings on Aluminum for Corrosion Protection

D. Altenpohl: *Aluminium* (Germany). Vol. 31, p. 31 (1955).

Boehmite coatings, which consist of crystalline, water-containing aluminum oxide, represent a strengthening of the natural oxide coating and are applied to the metal by means of steam or boiling, distilled water. Investigations on the application of these coatings for the corrosion protection of pure aluminum, Raffinal alloy and some of the corrosion-resistant alloys served to show that the protection action of these coatings is, generally, quite appreciable. Thus, the resistance of the aluminum towards mildly corrosive media, particularly weak acids and chloride ions, can be raised by a factor of 8 to 30, by means of suitable Boehmite coatings. The protective action of anodized coatings, which are about 5 to 15 times thicker, is not generally attained. However, in weak acids the solubility of the crystalline coating can be lower than that of the amorphous anodized coating. The conversion coatings have a considerably higher chemical resistance and are easier to apply.

For general industrial corrosion-protection purposes, the new coatings appear to be worthy of consideration for equipment construction, for example, drying installations, silos, ventilation systems, washing machines, heat exchangers, etc. The coatings should be useful also for food prepar-

ing and manufacturing equipment. A useful feature of the coatings, particularly for food preparing and handling purposes is the fact that any affect on the taste which is given by aluminum metal, is suppressed by these coatings.

These coatings are produced (1) In boiling distilled water with a varying pH value (or softened water with less than 1.5 degrees of hardness — German); (2) In saturated steam at 105° to 155°C. (equivalent to 0.2 to 4.8 atmospheres pressure); (3) In tap water at 75° to 85°C., the pH value of which has been adjusted to 11 by soda. The coatings formed, which are from 0.3 microns thick, are slightly milky, can occur in two different modifications, of which one is soluble in acids; the other aged modification is insoluble or only slightly so and, at the same time, gives better corrosion protection. Accordingly, in many cases it is preferable to use steam as the insoluble coating is formed after a short time. Thorough cleaning and pre-pickling of the aluminum surface before treatment is necessary.

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### Oxide Coatings on Tin and Their Strengthening to Improve Corrosion Resistance

S. C. Britton: *Metaux*. Vol. 30, No. 355, p. 134.

Most metals become covered in air with a thin oxide film, which grows with the increasing action of oxygen and at higher temperatures. This occurs all the sooner, the more rapidly the metal ions and electrons, for example, with the action of an aqueous solution, pass through the porous oxide film and can form oxides. In this way a protective film which becomes more and more dense, is formed which acts as corrosion inhibitive. Regarding the oxide coatings on tin it is known that they are very thin (20Å) and particularly dense. As a result, it is not simple to strengthen them artificially. It is only at temperatures of 200°C. that the oxide film grows in a furnace atmosphere in such a manner that interference colors show. This oxide film is soluble in certain weak and strong acids and in strong bases. It is only slowly destroyed by alkaline solutions. Against neutral and almost neutral mediums, it acts as corrosion-protective.

Effective protective coatings on tin surfaces can be produced by anodic treatment in various alkaline solutions. With a correspondingly long treatment, coatings of such a thickness can be prepared that interference colors up to black occur. These coatings are not actually stable in acids or strong bases, but do provide protection against medium corrosion attack.

Short period electrolytic treatment (around 2 seconds) is applied for the storage preservation of tinplate. With the use of chromate electrolytes there is formed a dense oxide film.

By dipping in warm chromic acid solutions, the coatings produced have a greater protective effect if the weak oxide film, which is initially present on every tin surface, is previously removed. With this treatment, however, fine pores present in the tin coating are not closed, so that the iron subsurface can rust. This is avoided, if a phosphoric acid-chromic acid mixture is used as the dip.

Another process which has been developed for the production of a passivating coating on tin surfaces is known as the Protectatin process.

These coatings have demonstrated their practical value for tinplate food can packs for food preserving. No protective film capable of sufficient resistance has yet been found, however, for fruit preserving packs.

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### Light Fastness of Organic Dyestuffs for Aluminum Coloring

C. T. Speiser: *Aluminium* (Germany). Vol. 31, p. 8 (1955).

The application of organic dyestuffs to large and complicated anodized aluminum surfaces for coloring purposes, is fairly easy, but the light fastness of these dyes is often a problem. The author gives details of a new process for the improvement of the light-fastness of anodized aluminum, colored with organic dyestuffs. The process which was worked out by the Baseler Farbstoff Fabrik consists in the fact that, in place of the usual water or nickel and cobalt acetate sealing, dyed surfaces are given a subsequent treatment in 2.5-5 g./l. solutions of lead acetate, copper sulfate, zinc chloride, or chromium sulfate. The treatment time is about 30 minutes at boiling. After this, parts are rinsed as usual and dried. It is preferable to use a solution of acetic or formic acid with clouded lead acetate. Sealing in this manner in lead acetate, copper sulfate, and chromium sulfate solutions, showed considerable improvement in the light-fastness figures obtained.

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### Which Nickel Anode for Which Nickel Bath?

W. Briese: *Metallwaren Industrie und Galvanotechnik*. Vol. 45, No. 5, p. 205.

Cast anodes, which are the cheapest, can be used in nickel baths operating at low current densities. Recently, cast anodes with a high carbon content have been placed on the market which form an adherent film on the anode surface during anodic solution, consisting of carbon and silicon, which retains the slime particles. These anodes can be used in a still bath without bagging. The cast anode is also very easily soluble with a low chloride content of the bath.

Electrolytic anodes are used mainly in bright nickel baths. The bright nickel bath is particularly sensitive to metallic impurities and the high purity of the electrolytic nickel anode prevents trouble. In baths with a low chloride content, electrolytic anodes become passive very easily. A further disadvantage of this type of anode is that it dissolves very non-uniformly. Rolled anodes are excellent for use in lightly warmed baths with normal conductive salt and chloride content. Because of the easy solubility there is frequently observed, on working with rolled anodes, an increase of the pH value to the higher range. Depolarized anodes have been developed to operate with high current densities and pH values. A characteristic of this type of anode is that the pH value of the bath should not be higher than 5.8. The bath should not contain less than 6 g./l. of chloride ions.

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### Analytical Control of Alkaline Degreasing Baths

*Metallwarenindustrie und Galvanotechnik*. Vol. 45, No. 5, p. 229.

For operational control of alkaline degreasing baths, determinations are made (1) Of active sodium oxide content; (2) Of total sodium oxide content; (3) pH; (4) Wetting agent content. It is on these factors that the operating effectiveness of the bath depends. Details of the determinations are given.

# Recent Developments

NEW METHODS, MATERIALS AND EQUIPMENT
FOR THE METAL FINISHING INDUSTRIES

### Anodize Thickness Tester

*R. O. Hull & Co., Inc., Dept. MF, 1300 Parsons Court, Rocky River 16, Ohio.*

A new Rohco Anodicator automatically checks thickness of anodic coatings on aluminum by dielectric spotchecks.

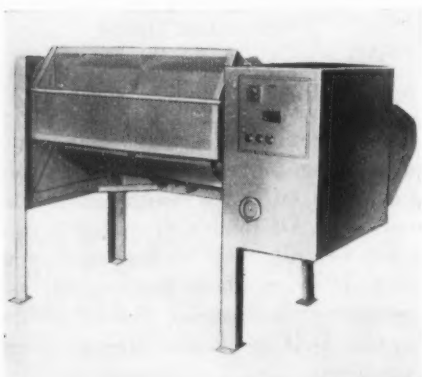
The device provides a reliable method of testing anodized aluminum and its alloys as specified in ASTM B110-45. It incorporates two important factors in the measurement of dielectric strength (1) a uniform, slow rate of voltage increase and (2) uniform pressure of the probe on the anodic surface. The instrument features a motor driven voltage elevator, and automatically indicates the minimum voltage upon break-through when a light appears. Toggle switch automatically resets to zero voltage for next test.

42/Circle on Readers' Service Card

### Multi-Barrel Finisher

*Rampe Mfg. Co., Dept. MF, 14915 Woodworth Ave., Cleveland 10, Ohio.*

Designed as a heavy-duty unit suitable for many tumbling, burnishing and deburring operations, Model V-16 multi-barrel finishing unit features a variable-speed direct gear drive. This eliminates need for chains and sprockets and permits simple speed adjustments from 8 to 25 rpm. With built-in magnetic brake and perforated metal safety guard in front of barrels, fast production finishing can be performed with full control and safety.



Added features include large 16 cu. ft. capacity, choice of one to four compartment barrels, no-seam vinyl barrel linings, 3 h.p. motor, forward and reverse jogging switches and all-welded ¼″ steel plate construction. The unit has 30″ clearance under barrels and measures 82″ long by 42″ wide and 64″ high.

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### Hard Bright Gold

*Technic, Inc., Dept. MF, 39 Snow St., Providence, R. I.*

All the attributes that have been sought in hard bright gold are now available through the new HC Gold.

Qualities assured are described as including super hardness (130-150 DPH) and low stress with less porosity than the usual bright gold. Karat is high, in the 23-plus range. Deposits are bright and smooth-grained.

Efficiency is said to be high, less gold being required to meet most specifications. With the wide operating range from 60° to 95°, no cooling or heating is required. Cyanide is low, less than 1/10 oz./gal. No organic brighteners are required. Cost is advantageous, being less than 10c per troy oz. over the cost of regular 24 kt. gold.

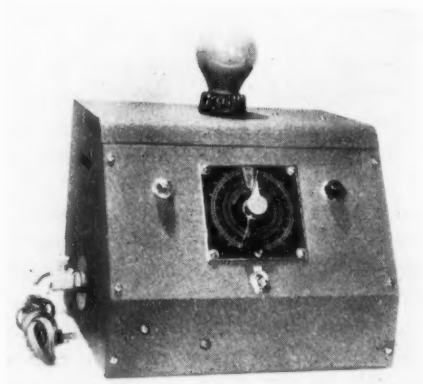
44/Circle on Readers' Service Card

### Plating Timer

*Cadillac Rectifier Div., R.E.P. Electric Prod. Co., Dept. MF, 539 Webster Ave., New Rochelle, N. Y.*

A new automatic timer starts as soon as work is put into the plating tank, signals with buzzer and light at the end of the preset time and then continues signalling until it is switched off or work is removed from the tank. It instantly resets for the next cycle automatically.

Installation is simple, requiring only a connection in one d.c. line between



power source and plating tank. Of all-steel, welded construction, the cabinet has a corrosion-resistant finish.

The unit is made in capacities to 200 amperes and time ranges from ¼ second to 5 minutes.

45/Circle on Readers' Service Card

### Cadmium Brightener

*Smoothex, Inc., Dept. MF, 10705 Briggs Road, Cleveland, Ohio.*

Faster plating action, increased brightness and a longer brighter life are the claims made for Cad-Kote, a new cadmium brightener. The consistently bright deposits, created by the new brightener, impart an extremely high luster to the entire surface of all the parts. Plating time is reduced because the need for subsequent bright dipping is eliminated.

The material, with its increased plating range for both barrel and still plating, is also claimed to eliminate burning. Although it performs best in a new bath, the conversion of existing bright cadmium baths is easily and inexpensively accomplished. It is easily controlled and plates in deep recesses with unusual throwing power, it is stated.

46/Circle on Readers' Service Card

### Silicon Rectifiers

*General Electric Co., Rectifier Dept., Dept. MF, Lynn, Mass.*

Ratings up to 140 amperes per cell are available in new high power silicon

# NEW

# H-VW-M

**Dincalux Portable Filter with 900 GPH capacity**

**ONLY $325**

**Faster, better filtration of plating solution for lower cost per gallon**

## 11 Big Features of H-VW-M's Dincalux Filter

1. Large filter plate area of over 3.5 sq. feet of long-lasting Perspex plastic.
2. High production capacity—900 gph free flow, 600 gph with carbon charge.
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8. Unit only 15"x15"x28" high.
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Every part in contact with solution is of durable plastic, highly resistant to acids and alkalies and suitable for temperatures up to 150°F.

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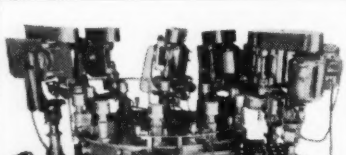

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48/Circle on Readers' Service Card

component rectifiers. Heart of the new rectifier is a small silicon wafer in a hermetically sealed enclosure of ceramic and welded stainless steel. This same construction is now being used in over 35,000 kilowatts of the company's germanium power equipments.

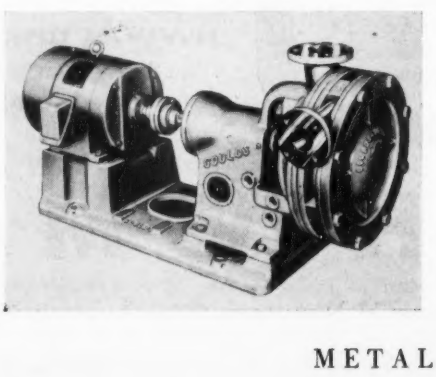
The high power silicon rectifiers are designed for air or liquid cooling and may also be used in convection cooled applications at lower current ratings.

49/Circle on Readers' Service Card

### Glassed Centrifugal Pump

*Goulds Pumps, Inc., Dept. MF, 32 Black Brodic Rd., Rochester, N. Y.*

The Fig. 3708 glassed pump is completely inert to all common acids except hydrofluoric. Even at high temperatures, all acids except hydrofluoric and concentrated phosphoric leave working surfaces unaffected. Glass surfaces of the pump are also immune to the corrosive action of all alkalies up to pH 12 and temperatures up to 212° F.



Through a series of successive applications and firings, the glass is permanently fused to the metal pump parts so that the glass and metal interlock mechanically and form an inseparable bond. In addition, because of the interlocking action of the glass and metal at fusion temperatures, fractures will not "run". Therefore, sharp mechanical impact can cause damage only at the point of impact. The glassed pump will normally withstand quick changes of temperature of the liquids handled up to at least a 200°F. differential and higher depending upon operating conditions.

The new pump is available for heads up to 140 feet and is built in four sizes with capacities up to 700 g.p.m. Suction piece, casing and casing cover are all glassed where there is liquid contact. The semi-open, statically and hydraulically balanced impeller is glassed on all sides. Mechanical seal of the outside type is standard. Support head is designed with wide openings giving ready access to the seal or optional gland and stuffing box.

50/Circle on Readers' Service Card

### Protective Coatings

*Carboline Co., Dept. MF, 331 Thornton Ave., St. Louis 19, Mo.*

These new liquid zinc coatings are applied to steel by brush or spray. When cured, a tight non-porous, 4-10 mil film in one coat offers galvanic protection to the steel. When the zinc is eventually sacrificed, a new coat can be applied in the field to continue the protection. The coatings can be applied over power brushed rusty steel for service other than tank linings.

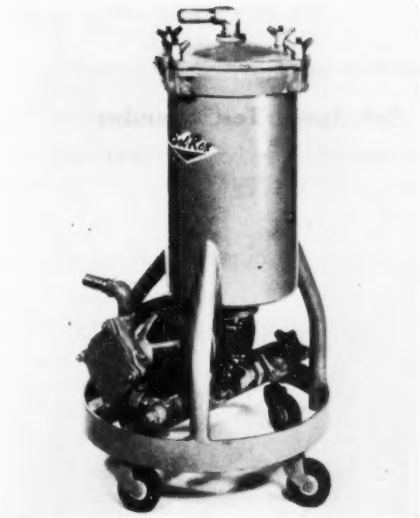
Three types of coatings are now available — XR 150-40 for lining fresh water tanks and pipe, XR 150-62 for lining brine tanks and protecting sandblasted steel from marine and industrial atmospheres, XR 150-43 for application to rusty, wirebrushed structural steel in industrial and marine atmospheres.

51/Circle on Readers' Service Card

### New Portable Filter Doubles As Pump

*Sel-Rex Corp., Dept. MF, Nutley, N. J.*

A new, portable liquid clarification filter is equipped with a special bypass valve allowing the pump to be used for solution transfer. Known as the Filter BS-3, the unit measures 36"



in height, requires only 1½ square feet floor space, and has a capacity of 300 gallons per hour.

The new filter is equipped with an exclusive annular stainless steel mesh element which filters through both the inner and outer surfaces. This design provides twice the filtering area of any element of comparable size, according to the manufacturer.

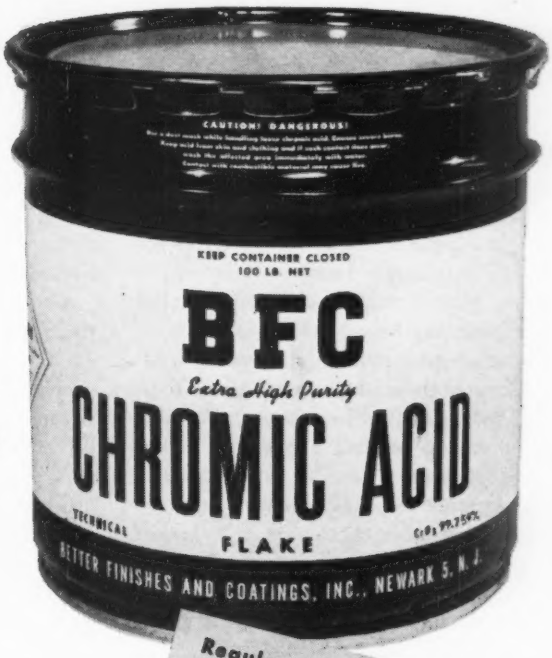
Other features of the filter include: entire filtering element attached to tank cover — lifts out easily for thorough cleaning in 15 minutes or less; converts quickly to use with standard porous stone membrane for special applications, with no replacement parts needed; all working parts suspended beneath tank to protect them from dirt or drippings, yet easily accessible for routine servicing; mounted on heavy duty wheels for positioning wherever it is needed.

The new filter is available in extra low carbon stainless steel and rubber lined, or all iron construction, depending on the specific application.

52/Circle on Readers' Service Card

LOOKIN' FOR QUALITY?

LOOKIN' FOR SERVICE?



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Newark 5, New Jersey

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Regular Flake—Thin Flake—Ground—whatever your Chromic Acid needs, we can supply them—promptly. Fast shipments from plant and nearby distributor stocks. All extra high quality 99.75+% pure.

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53/Circle on Readers' Service Card


### Germanium Rectifier Junctions

*International Rectifier Corp., Dept. MF, 1521 E. Grand Ave., El Segundo, Calif.*

A new series of 330-amp germanium power rectifier junctions are engineered to provide high reliability in heavy power applications. This series of six types is rated at 330 amps rectified output current at voltage ratings from 20 to 66 volts rms.

Conservatively rated for dependability, these low current density, high capacity junctions feature corrosion and moisture resistant cast-aluminum

housings with airfoil type cooling fins for maximum heat dissipation. Efficiency to 98.5% and small unit size (only 4-3/32" x 3" x 3¼") offer definite size and weight advantages to power conversion equipment. Six 330 amp germanium junctions connected in a three-phase bridge circuit will deliver 85 kw, (1,000 amps @ 85v) while occupying only ½ cubic foot of space.

54/Circle on Readers' Service Card

### Plastic Construction Material

*Heil Process Equip. Corp., Dept. MF, 12901 Elmwood Ave., Cleveland 11, Ohio.*

Rigiply, a new two-ply type light-

weight plastic construction material for severe corrosive fume service, is a fiber glass reinforced laminate of thermosetting resins which is resistant to a much wider range of chemicals, including both acids and alkalies, than has been possible in the past. A solid combination of two laminates, it insures long service life at minimum maintenance cost. The material can be engineered and fabricated for use in fume exhaust hoods, ducts, stacks, fume scrubbers, and tank covers for pickling, plating, and chemical plant operations up to temperatures of 250° F.

55/Circle on Readers' Service Card

### Protective Coating

*General Electric Co., Dept. MF, Schnectady 5, N. Y.*

Glyptal coating compounds now being marketed in 16-ounce pressure packs, sufficient to give corrosion protection to more than 85 square feet of surface. The coating compound is a clear synthetic varnish. Primary applications are protection against corrosion and oxidation of metal pieces being stored before finish painting; anti-spatter compound; primer for finish paint on metal surfaces.

The coating compound does not have to be removed before welding. Because of its properties, spatter cannot stick or weld to a surface with this coating. After welding, the burned area can be re-covered very quickly by pressure pack application.

The coating composition is available in 1, 5, and 55 gallon containers for brush application.

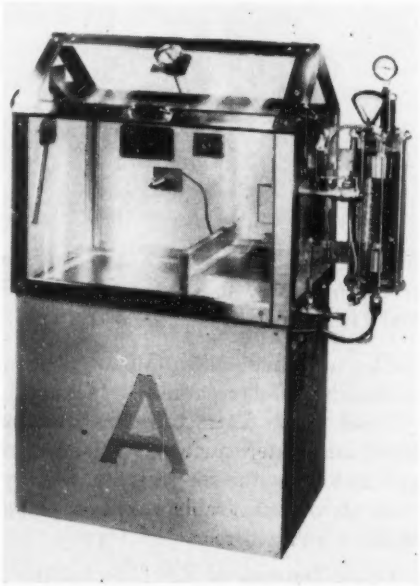
Also available is red coating composition, which covers a slightly smaller area than the clear, but offers protection for a longer period.

56/Circle on Readers' Service Card

### Salt Spray Test Chamber

*Associated Testing Laboratories, Dept. MF, 412 Clinton Road, Caldwell, N. J.*

A new, all-Lucite salt spray test



A Farewell to
CADMIUM
BLISTERS
See these blisters? We have to scrap almost all these parts. We're not getting the cutting oil off in the spray washer.
Hi, Jack, looks like I got here just in time!
"Say, Burt, how did Pennsalt develop this cleaner?" "Well, Jack, nobody knows more about metal-processing chemistry than Pennsalt. Our Whitemarsh Research Lab is constantly working on problems like yours, and Cleaner 38 is just one of their outstanding successes. By the way..."
...you can store these parts for a day or so before putting 'em on the plating line. The unrinsed cleaner film will prevent rusting.
Fine—I won't have to keep both lines running together now.

chamber for determining salt fog corrosion resistance of materials and components meets the exacting requirements of military specifications such as Mil-E-5272A and QQ-M-151a.

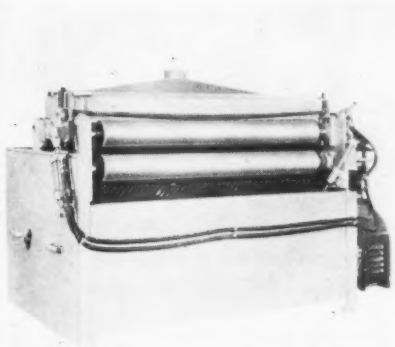
The chamber, when connected to a low pressure air supply, produces a fine mist, and reaches test conditions within 15 minutes. Specimens to be tested are then suspended from Lucite hanger rods which are supplied with the chamber. Bulkier components can be placed on the bottom of the chamber supported by Lucite rods to avoid contact with salt solution. The all-Lucite construction assures complete visibility of the test in progress, from all angles.

The chamber is equipped with temperature controllers and indicators for both the chamber and the air saturation tower. Dimensions of the chamber are 20″x20″x20″, (not including space for spray nozzle and solution storage), with larger sizes to special order. Complete with attractive steel base, the chamber is priced at $900.00, F.O.B. Caldwell, New Jersey. Delivery: stock to four weeks.

58/Circle on Readers' Service Card

### Belt Polishing Machine

*Timesavers, Inc., Dept. MF, Box 7446, Robbinsdale Station, Minneapolis 22, Minn.*



New Speedsander, Model SPL, features new production advantages for faster, smoother metal finishing. Outstanding design advantage is its 34″ feeding height: it's built to fit into any production set-up or conveyorized finishing line and to work in tandem with Model T.O.P. Speedsanders for sanding or polishing both sides at one pass. This compact unit also has exclusive automatic belt tracking — the simplest, most effective means of tracking wide abrasive belts through the use of swivel tracking rolls. Feed speeds available: up to 100 f.p.m. — higher speeds if required. The unit also features fast belt change. Finished materials are free from chatter or oscillation marks. Its "one pass" efficiency in most applications, plus minimum adjustments, reduces time and operating costs. Model SPL is available in 24″, 40″, 50″ and 60″ widths.

59/Circle on Readers' Service Card

### Gold Processes for Semiconductor Applications

*Precious Metals Div., Sel-Rex Corp., Dept. MF, Nutley, N. J.*

The development of Doped Gold Processes, utilizing Group 3 and 5 elements, for use in germanium and silicon semiconductor applications, has been announced by the above manufacturer.

Doped with antimony or other elements, depending on the desired physical properties, it is reported the new processes eliminate major shortcom-

Well, Burt Adams from Pennsalt! Can you keep our cadmium plate from blistering?
You need our new, low-foaming alkaline spray cleaner. I'll have a drum here tomorrow.
NEXT DAY...
What! Do we use only half as much as the old cleaner?
That's right, Jack. Pennsalt Cleaner 38 keeps your costs in line, besides being the end to your blistering troubles.
A WEEK LATER...
Hi, Burt. Yeah, the blisters are gone—we haven't sent more than two parts back since we switched to Pennsalt spray cleaning. Now—how about giving me a Pennsalt electrocleaner?

Blistered plating is just one finish problem Pennsalt can solve for you. Let the Pennsalt salesman help you achieve "A BETTER START FOR YOUR FINISH." Send the coupon today.

Pennsalt Chemicals

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Send me information on Pennsalt ☐ metal cleaners
☐ phosphate coatings ☐ cold-working lubricants

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Company_____

Street Address_____

City_____ Zone____ State_____

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# AN IMPORTANT ANNOUNCEMENT

For many years, electroplaters have relied on Seymour Bright Nickel processes for a unique combination of plating features. These features . . . combined in Seymour Bright Nickel Solutions . . . are:—*Greater Throwing Power—High Ductility—Simplicity of Control—Freedom from Hydrogen Pitting—Efficient, Dependable Plating Results at Low Cost.*

Now Seymour chemists and plating researchers proudly introduce another exclusive improvement on the Seymour Bright Nickel process. This unusual and useful product is called . . .

## CLARSOL

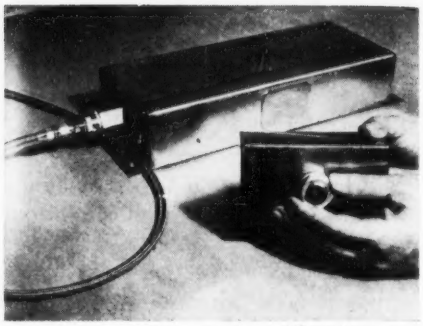
Seymour CLARSOL . . . already tested and in daily use by some of the country's principal plating shops . . . *improves* Seymour Bright Nickel processes because it—

- ***Gives greater tolerance to organic impurities.***
- ***Increases leveling of bright nickel deposits.***
- ***Permits plating at higher current densities.***
- ***Neutralizes the effect of excessive NC Fortifier.***

*WRITE TO OUR ELECTROCHEMICAL LABORATORY FOR DETAILS!*

**THE SEYMOUR MANUFACTURING COMPANY**
4 FRANKLIN STREET, SEYMOUR, CONNECTICUT

**60**/Circle on Readers' Service Card

outside of the tank. Shorting or grounding of the high-voltage lead or accidental damage to it is unlikely due to several layers of Teflon insulation and the braided steel sleeve surrounding it.

In addition to being completely water-tight, the new modular transducers have also been designed for optimum utilization of space. All edges are square, so that several units may be mounted next to each other with no more than 1/32 in. clearance. Dimensions are such that transducers are easily stacked, and almost any geometry is possible. Transducers may be mounted at the bottom of a tank or its side and, where desired, may be positioned to focus the ultrasonic energy in a very small area for maximum intensity. The transducers are available in many sizes, with effective cleaning areas for a single unit ranging from 3 x 5⅜ in. up to 6 x 14 in. When several are connected in parallel, up to 5 sq. ft. of transducer area can be driven from one ultrasonic generator.

**62**/Circle on Readers' Service Card

### Liquid Steam Cleaning Detergent

*Oakite Products, Inc., Dept. MF, 118 Rector St., New York 6, N. Y.*

Oakite LSD is a new liquid detergent designed for use in solution lifting steam guns and self generating steam cleaning equipment.

Developed to simplify the preparation of steam cleaning solution and to reduce the clogging of coils in self generating equipment, it will handle a wide variety of steam cleaning operations ranging from light to medium-heavy duty. The material is said to provide effective soil removal at concentrations of 1 to 2 ounces to each gallon of water as delivered by the gun. Used as recommended it is claimed to be safe on steel, brass, and magnesium, and to have no effect on painted surfaces. Its solutions have a pH of 12 in the operating range. Reports from users indicate that its use produces no offensive fumes.

**63**/Circle on Readers' Service Card

ings of conventional materials by operating at room temperatures, and producing bright, uniformly distributed gold deposits in required thicknesses, directly from the bath.

**61**/Circle on Readers' Service Card

### Welded Ultrasonic Transducers

*Branson Ultrasonic Corp., Dept. MF, 40 Brown House Road, Stamford, Conn.*

To permit the use of ultrasonic equipment with all types of active detergents, solvents, alkaline cleaners and even some mild acids, a new line of transducers with cleaning areas up to 84 sq. in., have housings of type AISI 316L stainless steel, with arc-welded joints, resulting in leak-proof and highly corrosion-resistant units.

Two types of welded transducers are currently available from stock, both in a wide range of sizes. The B series is fitted with a Teflon-gasketed bulkhead mounting, so that the electrical connection with the cable coming from the ultrasonic generator is made outside the cleaning tank. E series transducers are completely immersible in the cleaning fluid. One end of this type of transducer is fitted with a standard pipe thread (¾ in.) into which a stainless steel adapter is screwed. It permits the insertion of a Teflon-lined flexible stainless steel sleeve, carrying the "hot" lead from the transducer to a junction box on the

### Spray Plastisol

*Quelcor, Inc., Dept. MF, Front & Broomall St., Chester, Pa.*

A new polyvinyl chloride plastisol, called "Quel-Spray," that can be sprayed on cold vertical metal surfaces as a protection against chemical corrosion, is particularly useful in applying chemically resistant coatings to metal parts and structures which cannot be conveniently dip coated.

The product is a true plastisol and has many distinct advantages over PVC sprays which are modified plastisols and organisols. It requires no thinner, can be left in the gun overnight and loses no thickness from wet to dry film when cured at approximately 350° F.

**64**/Circle on Readers' Service Card

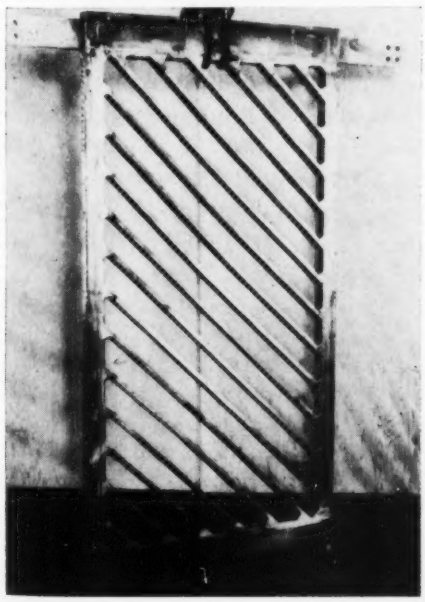
### Special Lead Anodes

*Heil Process Equip. Corp., Dept. MF, 12901 Elmwood Ave., Cleveland 11, Ohio.*

Complete facilities for design and fabrication of special or conforming lead anodes are announced by the above manufacturer. Widely used in chromium plating, anodizing, electropickling, electrogalvanizing, and lead or lead alloy plating, these special anodes are supplied in all sizes or shapes of any lead alloy desired. The special designs complement the firm's standard styles of flat, sawtooth, round, and herringbone anodes.

The lead anode shown is used in a continuous sheet steel plating process and employs specialized techniques in bonding the lead to the supporting copper frame.

The design and fabrication of conforming anodes incorporate experience developed in 25 years of lead specialization and include homogeneous bonding techniques, strength and current capacity considerations, and alloy selection for best service life.



**66**/Circle on Readers' Service Card

### Variable Flow Rate Pump-Motor Set

*Vanton Pump & Equip. Corp., Dept. MF, 201 Sweetland Ave., Hillside, N. J.*

A variable flow rate pump-motor set is designed specifically for pilot plant, laboratory or process work where controlled and varying rates of flow of corroisve fluids and abrasive slurries are required. With the pump driven by a variable speed source, a relatively linear relationship between speed and output can be obtained.

Several means of obtaining variable speeds are provided. One is a simple hand operated variable pitch pulley arrangement. Another is an integral variable speed motor drive in which provision is made for automatic process control by using an air cylinder to set the rpm of the variable speed drive.

An air signal, operating at an instrument pressure of 3-15 psi, is the


Why buy BLAKESLEE DEGREASING MACHINES

*PATENTS can be secured on almost anything. The item patented need not be practical or offer any worthwhile contribution.*

**PROFIT PRODUCING PATENTS**

Practical BLAKESLEE patented features result in economies of operation and savings in solvent consumption. The BLAKESLEE patented anti-diffusion chamber on conveyorized machines cut-off the evaporative area from 50% to 80%.

Another practical patented feature found only on BLAKESLEE degreasers is the patented solvent cooler. This cooler is located just ahead of the water separator and chills the solvent distillate to speed up and insure complete and constant separation of the water and solvent.

**OPERATING COSTS**

These costs are the most important to consider when deciding on new degreasing equipment; actually the initial machine cost is secondary. The patented features listed here are typical of the many, many features to be found only in BLAKESLEE degreasers.

***It will pay YOU to have a BLAKESLEE man call!***

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*also Manufacturers of Blakeslee Metal Parts Washers and Blacosolv Degreasing Solvent*

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**PIONEERS *and* LEADERS**

**in ELECTROLYTIC PRECIOUS METALS**

**DAVIS-K GOLD PLATING SOLUTIONS**

Through the years, Davis-K has continued to lead the field in producing low cost solutions, time-saving procedures and revolutionary new electroplates. From Davis-K research laboratories have come two of the most outstanding developments in recent years.

**ONE OPERATION**

***First* with Antique Gold Solution**

An inexpensive, quality electroplate with excellent color consistency and remarkable ease of operation.

***First Again* with HARD GOLD SOLUTION**

**FOR PRINTED CIRCUITS AND ELECTRONIC PARTS**

Davis-K Hard Gold Plating Solution is an amazing new electroplate for the electronic industry which cuts gold deposit 50% while forming a lasting bond with either metals or plastics. Requires no elaborate set-up, has maximum resistance to high frequency, plates at low temperature and eliminates control problems.

***OTHER DAVIS-K PRODUCTS***

★ POTASSIUM GOLD CYANIDE SALTS

★ LUSTROUS WHITE RHODIUM SOLUTION

Now available: variable-type Tank Rheostats, specially designed for precious metal plating.

ALL DAVIS-K GOLD PLATING SOLUTIONS ARE:

- made in all colors
- color constant
- tarnish-resistant
- brilliant in finish
- bottled by Troy weight
- made from assayed US Treasury Gold only
- Ready for immediate use

***FREE Consultive Service!***

As an added service, Davis-K process engineers are available for consultation concerning special plating problems and installations.

We are fully equipped to reclaim old gold and rhodium solutions. No charge for small sample plating. Write Dept. MFG-57 for details!

*"Where Glittering Elegance Reflects Lasting Quality."*

100% PURE GOLD DKP SOLUTIONS

**DAVIS-K PRODUCTS, CO.**

135 West 29th St., New York 1, N. Y.

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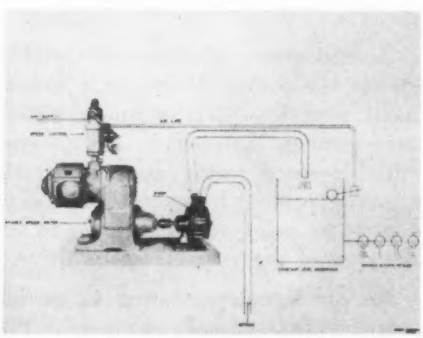
sensing and controlling portion of the system. The signal pressure controls the power air through an amplifier, thus controlling the rpm of the pump drive.



Constant liquid level control is a typical application of this automatically operated pump-motor set. As the outlet demands increase, the float lowers, in turn signalling a speed increase to the variable speed motor driving the pump. Conversely, as the level increases, the pump speed is automatically reduced, thus maintaining a constant level.

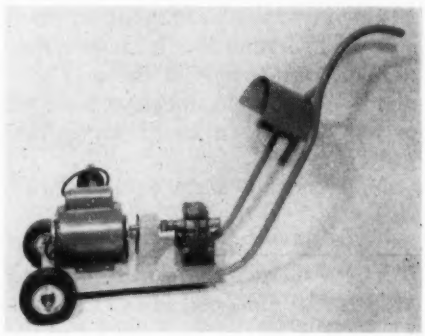
The pump has no stuffing boxes or shaft seals and the fluid conveyed is isolated to contact only with materials used in the unique flex-i-liner and the body block. These include a variety of plastic and natural synthetic rubber materials in nearly 700 combinations. The pumps are self-priming and flow rates from fractional to 40 gpm are available.

68/Circle on Readers' Service Card

### Portable Pump Dolly Unit

*Eco Engineering Co., Dept. MF, 12 New York Ave., Newark 1, N. J.*

A new portable pumping unit which mounts corrosion-resistant centrifugal or positive displacement pumps, weighs a maximum of 50 pounds with



pump and motor and measures only 20 inches long. The dolly is ideal for movement in narrow quarters as well as providing a rigid, vibration-free base for the pumping unit.

Pumps are available in Types 304, 316 or Carpenter 20 stainless steel, Hastelloy C or Monel; impeller materials of Teflon, Hypalon, Neoprene and phenolic. A selection of stuffing box assemblies includes Neoprene U-cups, Teflon packing or a fluid Teflon seal. Pumps have capacities up to 10 gpm and pressures to 75 psi. Motors may be specified from all standard types including explosion-proof and air motor drives.

Also available in the portable unit is a centrifugal pump of Carpenter 20 stainless steel with capacities to 40 gpm and heads to 50 feet.

69/Circle on Readers' Service Card

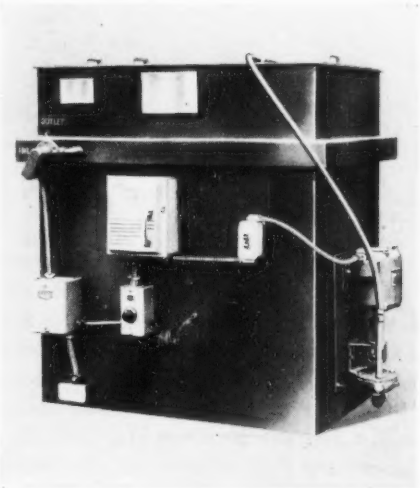
### Vapor Degreaser

*Aircon Div., Armstrong & White, Inc., Dept. MF, 119 Freeport Rd., Cheswick, Pa.*

This economical degreaser is supplied as a complete unit, with a low level thermostat control and water flow interlock which prevents boilout due to water supply failure. The unit is electrically fired on 220 or 440 volts and electrical heater load is controlled by heavy duty magnetic contactors.

A working area of 38″ x 22″ and a vapor depth of 24″ allows a load

cleaning capacity from 600 to 900 lbs. of steel per hour. Suitable for trichlorethylene solvents, it requires 16 gallons in boiling sump, 24 gallons in storage. Self solvent-distilling feature assures fresh solvent for spraying. Water consumption is 30 gallons per hour. Construction is of heavy gauge steel with a rust inhibitive interior coating. Total unit weight is 420 lbs., crated shipping weight—480 lbs.



The Model 75 vapor degreaser is priced at $625.00, complete with ¼ hp motor, centrifugal pump and manual spray lance.

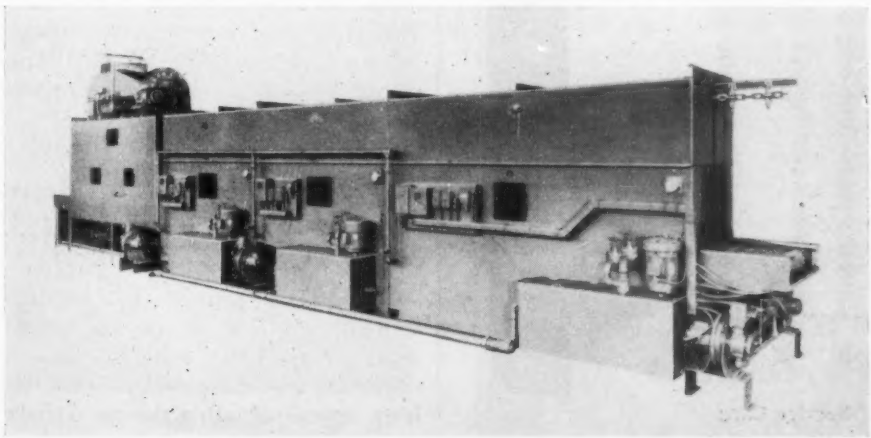
**70**/Circle on Readers' Service Card

### Automatic Processing Machine

*The Alvey-Ferguson Co., Dept. MF, 1436 Disney St., Cincinnati 9, Ohio.*

A new automatic cleaning, phosphate coating and drying machine is designed to handle a wide variety of metal stampings and to do the work of two machines in the space normally required by only one.

Designated the "Siamese Twin" Model CP, the machine incorporates both an overhead conveyor and a flat wire mesh belt conveyor to carry stamped parts through the automatically-timed cycles. Thus, the new machine can meet the varying requirements of different stampings as to vertical or horizontal handling for most effective power coverage and drainage. To ensure maximum utility and versatility, the two conveyors can be operated simultaneously or independently.



First cost as well as operating costs of this new unit are reduced by the use of a single tunnel through which the two conveyors pass, common solution tanks and spray system and common headers for water and drains requiring only one connection.

Leakage, and "wet floors" are eliminated by the use of new type vertical immersion pumps. Individual pressure-type gas burners are used to maintain proper temperatures in each solution tank.

The new machine is durably con-

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FUSED QUARTZ
IMMERSION HEATERS
FAMOUS THROUGHOUT
THE PLATING INDUSTRY
For Quality, Efficiency, Low Cost Operations
OVER 100,000 INSTALLATIONS
For alkaline or acid heating jobs, you can depend on
CLEPCO ELECTRIC IMMERSION HEATERS
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THE WAY TO BIGGER PROFITS!

★ Pre-polishes greater area in less time than any contour polishing.

★ Lowest square foot cost of any method.

★ Saves stock cost by use of cheaper surface finish steel.

★ Improves press and die action.

★ Pre-polished steel gives outstanding results for even most exacting plating processes.

★ Uniform, pre-polished surface affords greater plating protection with minimum plate thickness.

★ Finishing before forming, cuts unit cost.

★ Rejects due to base metal finish are eliminated.



MICRO-POLISH units may be used singly or in line to suit your needs.

COMPLETE PACKAGE!

Murray-Way can give you a single machine or a completely automated production line engineered specifically to your requirements. We welcome your inquiries.

*Polishing, Buffing, Grinding, Filtering Equipment that automatically cuts your costs.*

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72/Circle on Readers' Service Card


structed of heavy steel plate. Provision has been made for easy access to spray areas and solution tanks to facilitate easy maintenance.

73/Circle on Readers' Service Card

### Erect-A-Rack

*Standard Plating Rack Co., Dept. MF, 1913-1925 N. Paulina St., Chicago 22, Ill.*



The above firm announces its Erect-A-Rack, standard component parts for plating, anodizing and painting. Only a wrench is needed, in using these pre-formed parts, instead of bulky equipment, for bending and forming, thus saving 60% to 90% in labor, with no drilling or tapping, according to the above manufacturer.

Simple and fast assembly gives almost any possible combination of rack contacts and arrangements. A full range of standard parts is available. All that is necessary is to clamp the desired contacts on a spine, slide along to get desired spacing, and tighten—no holes to drill, no big equipment needed, and no high cost. Any number of combinations are possible, it is claimed.

74/Circle on Readers' Service Card

### Glass Reinforced Plastic Pipe

*The Fibercast Corp., Dept. MF, Box 727, Sand Springs, Okla.*

Fibercast pipe, made from epoxy resin reinforced with glass braid will solve many problems arising from piping of corrosive materials, it is claimed. This type of corrosion resistant tubular goods is especially helpful if corrosion is severe, or high temperatures and pressures are involved.

75/Circle on Readers' Service Card

### Passivating Treatment for Brass

*Logo, Inc., Dept. MF, 12933 S. Stony Island Ave., Chicago 33, Ill.*

Brasslyfe, a process that passifies and protects brass in one application is an air dry spray material, claimed to prevent tarnishing and finger stains from appearing after the parts have

been shipped. It is also claimed to be a hard, tough, durable coating that shows excellent weather and humidity resistance. It can be sprayed, dipped, or brushed and, while chemical reactions continue for several days, parts can be packaged within an hour after application.

76/Circle on Readers' Service Card

## BUSINESS ITEMS

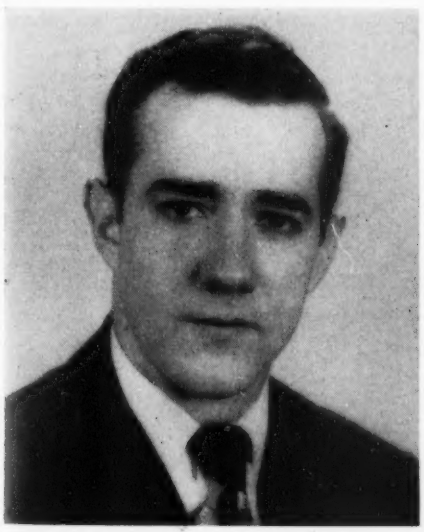
### American Smelting Buys Enthone

*American Smelting and Refining Co.* has acquired all of the outstanding stock of *Enthone, Inc.*, New Haven, Conn., in exchange for shares of common stock of ASARCO. An announcement stated that Enthone will be operated as a subsidiary.

Enthone, founded in 1938 by *Dr. Walter R. Meyer* and *J. F. Buckman*, occupies a respected position in the metal finishing industry. Sales and distribution policies will be coordinated as quickly as possible without jeopardizing the interests of the distributors now handling the two lines of products. Dr. Meyer will continue as president of Enthone. *M. R. Herman* of ASARCO will replace Mr. Buckman, vice president, who is retiring. *C. C. Helmle*, Enthone sales manager, and *Sherman M. Goble*, manager of Federated's Electrochemical Department, will coordinate the sales efforts.

### Lea-Michigan Advances Allan

*Bob Allan*, chemist at *Lea-Michigan*,

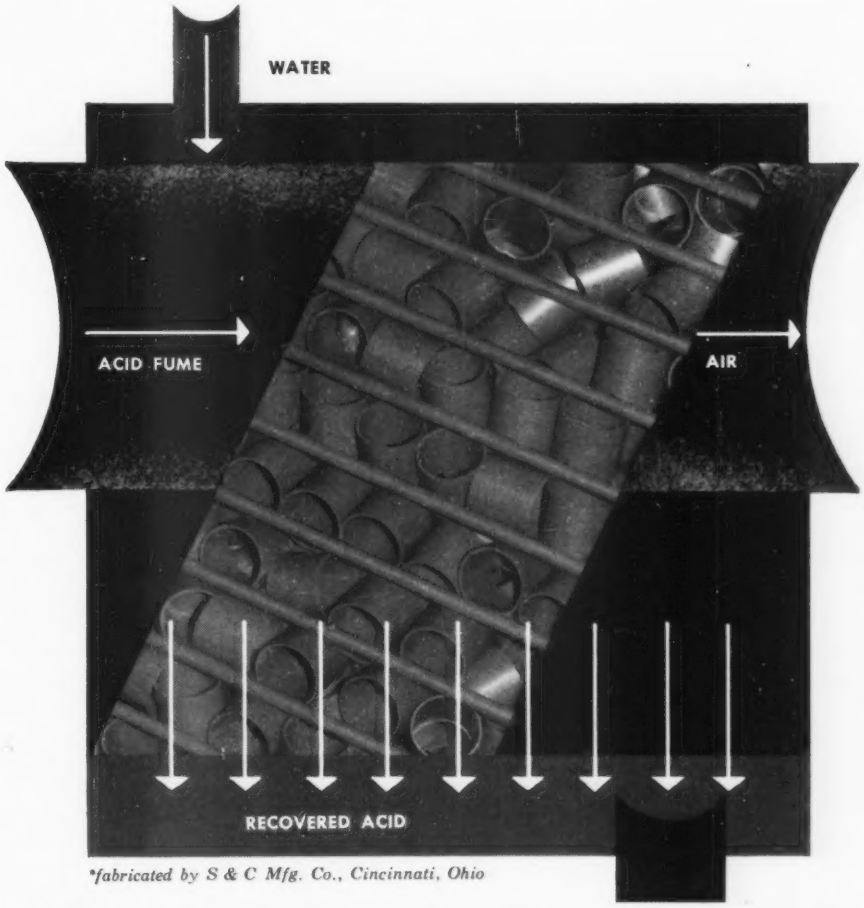


Bob Allan


## 12,000 cfm pvc scrubber* cuts weight 83% . . . cuts costs 33%

NOW 12,000 CFM air and acid fume scrubbers are being completely constructed of Vyflex F-92 rigid PVC . . . even to the nuts, bolts, and rings. Only the sump is metal, and even it is lined with Vyflex FLIGID PVC lining.

Little more than a sixth the weight of conventional designs, and costing considerably less, the new PVC scrubbers equal or better them in terms of performance. In chromic acid service, for example, their efficiency is such that 95% recovery of the acid can be affected.




*fabricated by S & C Mfg. Co., Cincinnati, Ohio

Often used for hoods, ducts, etc., in corrosive service, Vyflex F-92 is an excellent choice for these scrubbers. Inert to the widest range of corrosive fume, splash, and liquid at temperatures to 165F, this unplasticized Polyvinyl Chloride offers such attractive physicals as high tensile and flexural strength, hardness, abrasion resistance, and electrical and thermal insulation properties. High strength-to-weight ratio even permits such large structures as these scrubbers to be suspended easily from plant ceilings.

Well equipped, highly experienced Kaykor fabricators across the country stand ready to solve *your* corrosion problems with standard or custom designed equipment and parts of Vyflex F-92 PVC.

*GET THE FACTS! Write for complete information in new Bulletin "F-92", Available free on request to Kaykor Industries, Inc., 4403 Broad Street, Yardville, New Jersey, or ask your local Kaykor fabricator.*

K®
KAYKOR INDUSTRIES INC.
Division of Kaye-Tex Manufacturing Corp.
YARDVILLE, NEW JERSEY

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*Inc.*, Detroit, Mich. has been advanced to a post in charge of production and the laboratory. Bob was born in Willis, Mich. He is a graduate of Michigan State Normal College receiving a Bachelor of Science Degree in Chemistry in 1953. Prior to working for the company, he spent two years in the Army at the Engineer Center, Fort Belvoir, Va., as an instructor of water supply and purification.

### Northwest Chemical Appoints West Coast Licensee

*Northwest Chemical Co.*, of Detroit has licensed the *Alert Supply Co.* of Los Angeles, Calif., to manufacture its line of specialized cleaning compounds, which the latter have sold for the past four years to West Coast industries.

Alert Supply will operate from a newly completed warehouse and factory which has been thoroughly equipped with the most modern mixing machinery. With the completion of their new plant, Alert is fully equipped to produce the full line on the Coast. Under the supervision of Northwest technicians, manufacturing was begun March 15th. Complete stocks backed by adequate service are now available.

### Executive Changes at Federated Metals

*Samuel A. Glueck*, former general manager of the Eastern Department of *Federated Metals Division, American Smelting and Refining Co.*, has been named general manager of the Midwestern Department. *Louis D. Alpert*, manager of the Los Angeles plant has

Samuel A. Glueck

Louis D. Alpert

been appointed general manager of the Eastern Department.

Mr. Glueck, who will make his headquarters at the Whiting, Ind., plant, has been with the company since 1933. He first worked at the Chicago plant. In 1952 he became General Manager of the Eastern Department, which includes Perth Amboy, Newark and Pittsburgh operations.

Mr. Alpert joined the firm as a research chemist in 1935. Since 1942 he has been associated with the company's west coast operations, and has been manager of the Los Angeles plant since 1952.

### International Rectifier Opens New England Branch Office

*International Rectifier Corp.* of El Segundo, Calif., announces the opening of a New England area branch office, and two new appointments within their sales organization.

*Henry Di Mond*, an electrical engineer with many years of rectifier experience, has been named district manager of the new sales office, located at 17 Dunster St., Cambridge 38, Mass.

Simultaneously, announcement was made of the appointment of *John Vickery* to the post of industrial sales manager at the firm's main office. Mr. Vickery, formerly assistant sales manager, is an electrical engineer of more than fifteen years direct experience in industrial heavy power rectifier applications. He has been associated with the company for the past three years.

The appointment of *Herman Bloom* to distributor sales manager follows more than five years experience in electronic distributor sales management.

### New Representatives for Allied Research Products

*Allied Research Products, Inc.*, Baltimore manufacturer of chromate conversion coatings and plating chemicals, has announced the following appointments to its sales organization.

*William F. Cahill* is the new distributor for Maine, New Hampshire, Vermont, Rhode Island and Massachusetts from headquarters at Providence, Rhode Island. The Cahill organization has been distributing chemicals to the metal finishing industry for many years.

*Roger Fenwick* has been transferred to Cleveland, from which he will cover Western Pennsylvania and Northeastern Ohio. Mr. Fenwick has been with Allied for five years.

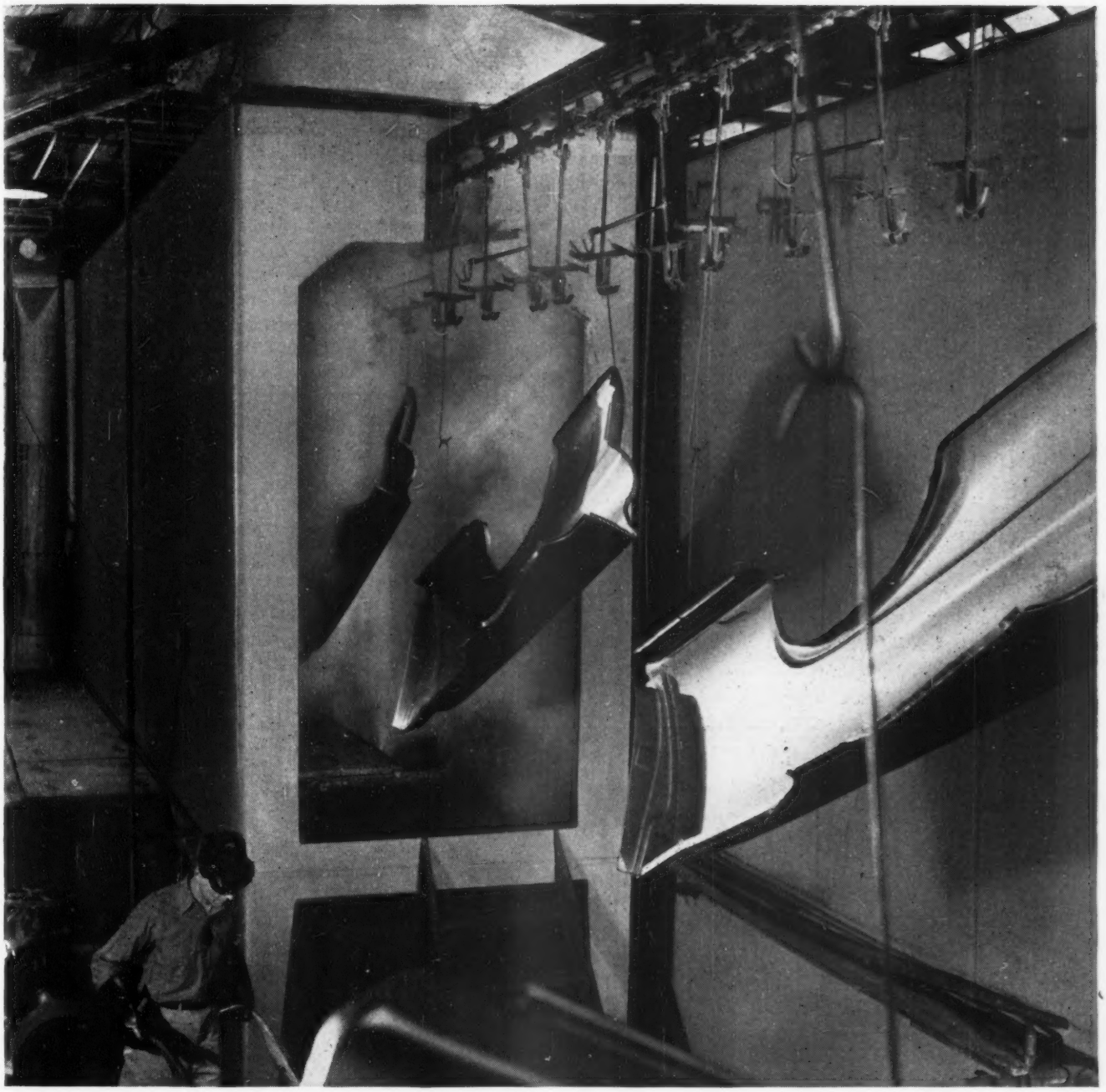
### Sel-Rex Corp. Names Wilson General Sales Manager

The appointment of *S. S. Wilson* as executive vice president and general sales manager has been announced by *Sel-Rex Corporation* manufacturers of metal finishing equipment and supplies.

Wilson, a graduate of Penn State with a B.S. in Chemistry, was formerly vice president in charge of the Detroit office, and was responsible for all midwestern operations for the past three years. Prior to joining the company in 1949, he had been with Koppers Chem. Co. for six years, in executive positions in both sales and production, and three years with Sennett Steel Corp. in a supervisory sales capacity.

Mr. Wilson will make his head-

S. S. Wilson



# Experienced formulators know metal cleaners containing Dow Alkali do top job

Does the formulator of your cleaning compounds use Dow Alkali? Many plants, large and small, have cut costs substantially by switching to formulations containing Dow Sodium Orthosilicate or Dow Caustic Soda.

Experienced users of metal cleaning compounds prefer formulations made with Dow Alkali for spray cleaning, soak cleaning and electrolytic cleaning. That's an important fact for anyone who cleans metal parts to keep in mind. The reason is simply that experienced users are in the best position to judge the effectiveness and economy of the cleaning materials they use.

Their years of experience have proved to them that formulations made with Dow Alkali *consistently* give them the best results in terms of faster, more thorough cleaning and with fewer parts rejected—because Dow Alkali delivers the most effective cleaning power money can buy! THE DOW CHEMICAL COMPANY, Midland, Michigan, Department AL 610K-1.

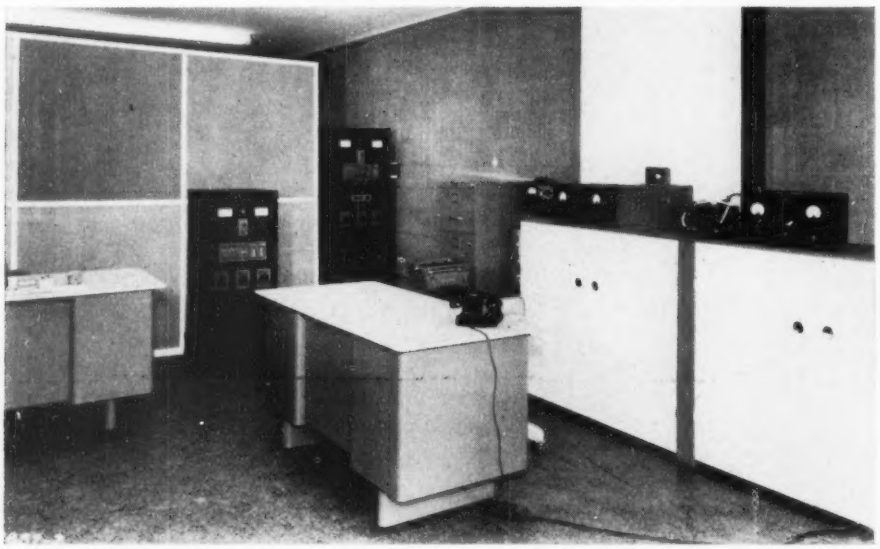
YOU CAN DEPEND ON DOW

quarters at the firm's new executive offices building located at 75 River Road, Nutley 10, N. J.

### Rapid Electric Opens Detroit Office

*Rapid Electric Co.*, 2881 Middletown Road Bronx 61, N. Y. announces the opening of its Detroit branch office at 12838 Fenkell Ave.

*George DeMirjian* will direct sales/service operations. Complete sales and display facilities will be offered the Detroit and surrounding area. Standard rectifier units will be stocked for immediate delivery. A complete repair and parts replacements service will be offered also.



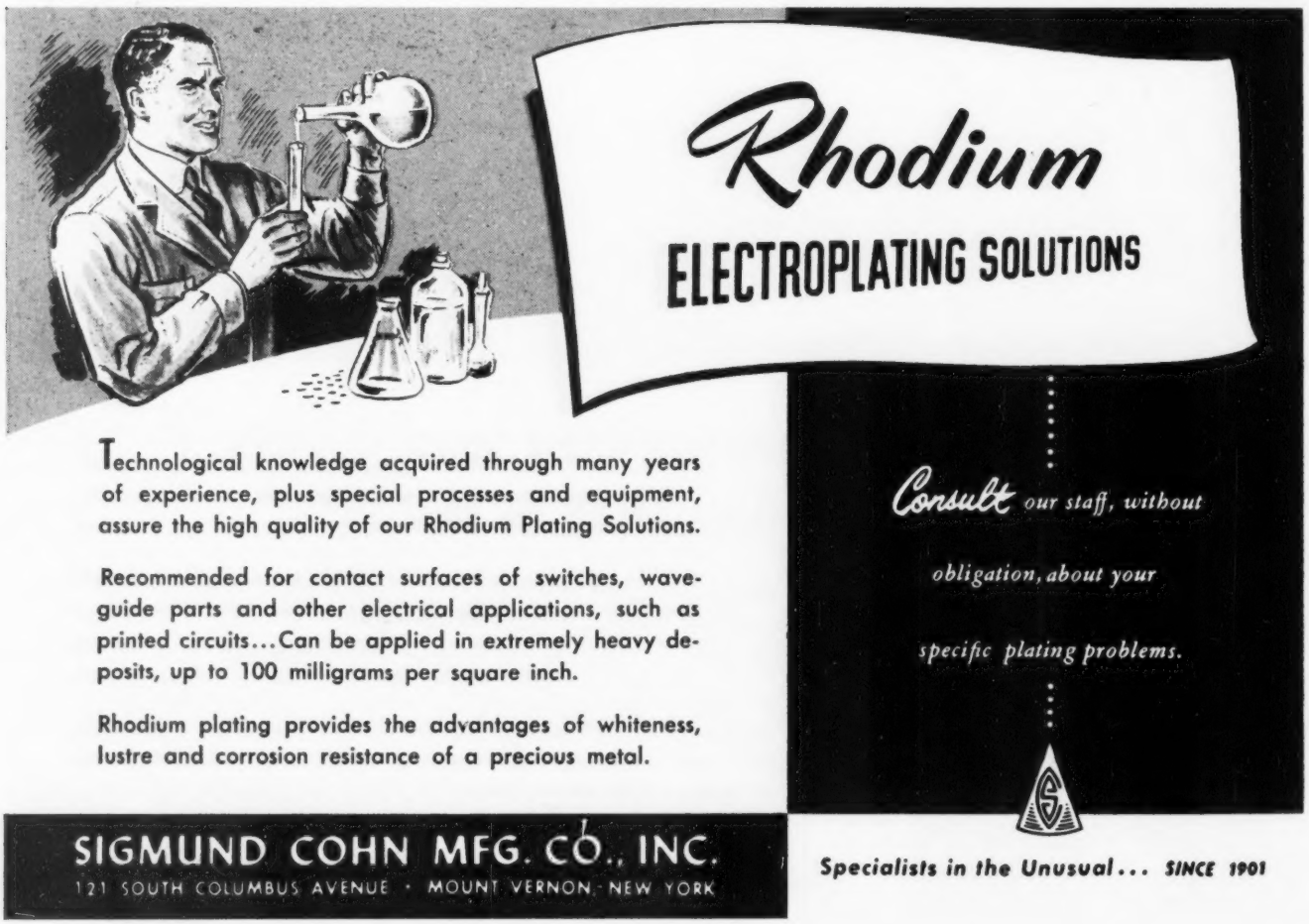
### Technic Appoints Marchuk Co. As Western Representative

*Technic, Inc.* announces appointment of *The F. J. Marchuk Co.* as its representative in the states of Arizona, California, New Mexico, Oregon and Washington. The new Marchuk offices are at 261 E. Colorado St., Pasadena, Calif.

In addition to Technic's engineered electroplating systems, The Marchuk Company will distribute their potassium gold cyanide, sodium gold cyanide, hard bright gold, rhodium sulfate, palladium plating solution, platinum plating solution, immersion tin, and Protectox silver and copper antitarnish.

### Chicago Rubber Names 2 As State Representatives

Appointment of factory representatives for Illinois and Michigan has been announced by *Chicago Rubber Co.*, Waukegan, Ill. manufacturers of



Rhodium
ELECTROPLATING SOLUTIONS
Technological knowledge acquired through many years of experience, plus special processes and equipment, assure the high quality of our Rhodium Plating Solutions.
Recommended for contact surfaces of switches, waveguide parts and other electrical applications, such as printed circuits...Can be applied in extremely heavy deposits, up to 100 milligrams per square inch.
Rhodium plating provides the advantages of whiteness, lustre and corrosion resistance of a precious metal.
Consult our staff, without obligation, about your specific plating problems.
SIGMUND COHN MFG. CO., INC.
121 SOUTH COLUMBUS AVENUE · MOUNT VERNON, NEW YORK
Specialists in the Unusual... SINCE 1901

rubber contact wheels for abrasive belts and other molded rubber products.

*Frank N. Capparelli* will cover Illinois from headquarters at 15 S. Austin Blvd., Chicago 44. *James A. Belanger*, 15620 Meadowood, Royal Oak, Mich., becomes Michigan representative.

### Sethco Mfg. Co. in New Quarters

The first step in a long range expansion program has been announced by the *Sethco Mfg. Co.* Since June 1, the firm's new factory and offices have been housed in their own recently completed building located at 2286 Babylon Turnpike, in suburban Merrick, N. Y.

Devoted exclusively to the development and manufacture of filters, pumps, and filter pump units, the modern plant is fully equipped with many new, streamlined production methods for greater output, quality control and economy. Increased floor space, manufacturing and warehousing facilities will speed-up more efficient service.

Also expanded is the research department working out solutions to filter problems and keeping pace with industry's advances in new corrosion resistant plastics and special metal alloys.

### Richey Joins Wagner Bros., Inc.

*Phil H. Richey*, former plant manager of the Bowling Green, Ky. facilities of Detrex Chemical Industries Inc., has been appointed vice-president, finance for *Wagner Bros. Inc.* In his new position, he will direct all financial and accounting operations for the Detroit manufacturer of plating equipment and supplies.

After a period as credit analyst with the Detroit Bank, Richey joined Detrex in 1948 as a member of the controller's staff. He subsequently assumed successive responsibilities as coordinator of federal government liaison during the Korean conflict, personnel director, chairman of the bargaining and inventory committees, member of the corporation finance committee, and finally, assistant treasurer prior to his

New Schaffner bias
BUFFS
give more mileage...
because
...FULLY VENTILATED
...COOLER RUNNING
LOW COMPOUND CONSUMPTION
...FEWER SECTIONS NEEDED
...GIVES LONGER LIFE
...LATHE FACED AND BALANCED
Manufactured and controlled in our own new modern up-to-date Buff plant. Can be tailor made for your toughest buffing problem
MADE BY THE MANUFACTURERS OF FAMOUS AND ACCEPTED SCHAFFNER NO NUBBIN BUFFING COMPOSITIONS.
"Schaffner Bros. make things shine"
Bob — Paul — Gus
Schaffner
MANUFACTURING COMPANY, INC.
SCHAFFNER CENTER • ROSEWOOD 1-9902 • EMSWORTH, PITTSBURGH 2, PA.
* TRIPOLI COMPOUNDS * CHROME COLORING ROUGE * GREEN ROUGE * JEWELERS' ROUGE
* CROCUS COMPOUND * STAINLESS STEEL COMPOUNDS * ALUMINUM BUFFING COMPOUNDS
* ALL-PURPOSE BUFFING COMPOUNDS * WHITE COLORING COMPOUNDS * NICKEL BUFFING (LIME) * EMERY CAKE * PLASTIC BUFFING COMPOUNDS * TALLOW GREASE STICK
* PUMICE GREASE STOCK * POLISHING WHEEL CEMENT * STEEL POLISHING COMPOUNDS
COMPOUNDS MADE IN BAR, SPRAY OR PASTE

Phil H. Richey

Clarence C. Smith

assignment as plant manager in April, 1954. He holds a BBA degree in business administration from the University of Michigan.

### Tranter Names C. C. Smith As Director of Engineering

Appointment of *Clarence C. Smith* as director of engineering has been announced by *Tranter Manufacturing, Inc.*

Mr. Smith holds a degree in engineering from Tri-State College of Engineering, Angola, Ind., where he was graduated in the upper third of his class. He has also studied at Albion (Michigan) College and the University of Michigan.

Mr. Smith formerly served as a design and project engineer for the Flint and Walling Mfg. Co., Inc., Kendallville, Ind., and the Duriron Co., Dayton, Ohio. Military service includes duty as a Navy pilot during World War II.

### Raybestos-Manhattan Sales Appointments

Four new sales appointments have been announced by *Raybestos-Manhattan, Inc.*, Passaic, N. J.

*T. W. R. Latham* has been appointed Los Angeles district manager. In this capacity he will supervise the sale and distribution in Southern California, Arizona and New Mexico. Mr. Latham brings to his new position 20 years of experience with an excellent production and industrial sales background. *S. V. V. Hoffman*, who functioned as Los Angeles district manager pro-tem, remains as Western Region manager, coordinating the activities of both the Los Angeles and San Francisco Districts.

*J. M. Ehman* has been appointed Birmingham assistant district manager.


**BEAM-KNODEL CO.**

Metropolitan Distributors

HANSON-VAN WINKLE-MUNNING CO.

Complete Service for Metal Finishing

Products Listed Below Available in New York Stock With Reasonable Exceptions

GENERATORS

| | | |
|---|---|---|
| Anodes, All Kinds | Tallow | Nickel Salts |
| Brushes | Rouge | Copper Salts |
| Buffs | Emery Paste | Cyanide |
| Chemicals | Cleaners | Tanks, All Kinds |
| Tripoli Comp. | Emery | Plating Barrels |
| Acme White Finish | Glue | Polishing Wheels |
| | | Polishing Lathes |

195 LAFAYETTE ST., COR. BROOME

Phone CAnal 6-3956-7 NEW YORK 12, N. Y.

FILTERS

MAIZO Drying Materials

LEA Buffing & Polishing PRODUCTS

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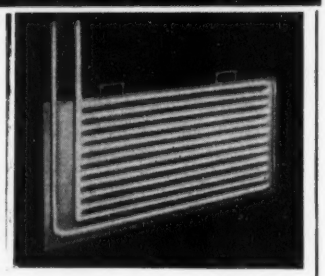
**GOOD BYE to PIPE COILS**

Old-style pipe coils are

Too Costly
Too Large
Too Heavy
Too Slow
Too Inconvenient
Too Inefficient

Metal finishing executives who have made a careful comparison are now using the



DEAN THERMO-PANEL COIL®

Ask for Bulletin 355 and learn all about this remarkable Dean creation which TAKES THE PLACE of pipe coils.

The photo above shows a standard Dean Thermo-Panel Coil. At the left is a plating tank in which one of these standard Dean Panels is used.

Bulletin 257 — Prices and Data — will enable you to do your own designing, if you wish. If you need help, call on our specialists.

*Backed by 20 Years of Panel Coil Manufacturing.*

DEAN THERMO-PANEL COIL DIVISION

DEAN PRODUCTS, INC. 613 Franklin Ave., BROOKLYN 38, N. Y.

Tel. STerling 9-5400

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*Nevin L. Rush* has been appointed manager, distributor sales, Philadelphia District. Mr. Rush has served in important sales capacities with the company for the past 12 years. As a specialist in distributor operation, he takes up his new duties well equipped to serve the best interests of the industrial distributors in this area.

*Julian P. Chilcote* has been appointed sales representative in the New York district. With his background of mining operations both in this country and abroad, he will adequately serve both the mining and oil industries in meeting their requirements. He will maintain close liaison with the Export Divison and worldwide mining interests, and is expected to make periodic trips to South America.

### Ryder Appointed General Sales Manager at Belmont

*Belmont Smelting & Refining Works, Inc.* of Brooklyn has announced that, as part of an enlarged and more intensive sales program, *William E. Ryder* has been appointed general sales manager. Mr. Ryder was formerly

William E. Ryder

vice-president of K W Battery Co. and manager of Eastern operations During World War II, Ryder, a Cornell graduate, was a deputy branch chief with the War Production Board's Aluminum and Magnesium Division.

### Lindstrom Appointed by Heatbath

*Heatbath Corp.* announces the appointment of *Bernard C. Lindstrom* as technical sales representative in New York State, exclusive of the Metropolitan New York City area. Mr. Lindstrom is a graduate of American International College with a B.A. in chemistry. For the past four years he has been handling technical sales and

Bernard C. Lindstrom


# TAKE IT OFF!!

WITH **PHOENIX COLD STRIPPER**

**Used Cold. Non-flammable.**

**Non-injurious.**

For speedy removal of tough industrial paints, enamels, synthetics, lacquers, varnishes, wrinkles, dye markings, graphite, metal lithography, epoxies, and enamel wire stripping.

- Apply by DIP — SPRAY — or BRUSH.
- WATER FLUSH — or RAG WIPE.
- REFINISH.

**PHOENIX COLD STRIPPER**

★ Will not affect precision parts of ferrous and non-ferrous metals, wood or glass.

★ Non-corrosive, Non-evaporating, Non-toxic.

★ Does not lose strength through usage. Just add new stripper to replace drag-out.

***Salvage Expensive Rejects At Low Cost!***

Write for SAMPLES and QUOTATIONS, or ORDER 5 GALLON AT DRUM PRICE.

**PHOENIX ABRASIVE & CHEMICAL CO.**

Dept. M

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# FIBERGLAS TANKS . . .

PPI

REINFORCED — RESIN BONDED

- Rugged
- Lightweight
- Long Lasting
- Non-Corrosive

FIBERGLAS CONSTRUCTION — ACID - RESISTANT

PPI Tanks are made of chemically resistant Fiberglas sheets . . . Joined together with a special Fiberglas resin. They can be used successfully for chromic acid bright dips, acid pickles, rinses after acids and certain plating solutions.

Advantages: Decreases maintenance and replacement expenses . . . No metal exposed to corrosion . . . No interior maintenance problems . . . Rundown and spillage do not affect exterior . . . Surface heat losses are minimized by the high insulation qualities of Fiberglas . . . Entire tank surface is nonconductive, which decreases electro plating hazards.

***Custom Built Tanks . . .*** **to Your Specifications**

PPI — Tanks are built to your needs and specifications. Send us dimensions and any other particulars such as overflow dams, nipples, etc., and we will be happy to quote prices.

***Dependable PPI Products . . .***

• PLATING RACKS • RUBBER DRUM LINERS • ACID CONTAINERS • ANODE HOOKS • FIBERGLAS TANKS, DUCTS & HOODS • PLASTIC COATED DIPPERS & PAILS • STEEL TANKS • STAINLESS STEEL TANKS • LEAD LINED TANKS • PLASTIC LINED TANKS • POLYETHYLENE PAILS & CONTAINERS • FUME SEPARATORS • PLATE COILS • LEAD ANODES • TRICHLOROETHYLENE • PERCHLOROETHYLENE • SILVER BRIGHTNER.

PLATING PRODUCTS, Inc.

1509 N. WASHINGTON
KOKOMO, INDIANA

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service from the home office in Springfield, Mass.

Mr. Lindstrom will handle the complete line of heat treating and metal finishing products manufactured by the company and will have his headquarters in Rochester, N. Y.

### Nickel Plating Industry Advisory Committee Meeting

The first meeting of the newly-formed Nickel Plating Industry Advisory Committee was held on May 1st by the Business and Defense Services Administration, U. S. Department of Commerce.

This committee, composed of representatives of both job and captive platers from small, medium, and large companies, was informed by BDSA officials that, as a result of meetings which the agency has held individually with the management of each of the plating supply houses, adherence to the principles of fair and equitable distribution of available nickel supplies to all plating consumers will be followed. The basic principles were set forth in the Department of Commerce supplemental report of February 15 to the Congress relating to the plating industry. The measures based on these principles provide, among other things, assurance that users of small quantities of nickel for plating will in the future receive full shares of the available metal.

The advisory group was also told that the demand for nickel probably will exceed the total amount available to United States consumers until 1959 or 1960. Additional production is expected, however, during the present year from the Government-owned Nicaro project in Cuba, some of which will be available for distribution to the plating industry through the nickel plating supply houses.

It was the consensus of the committee members and the Government officials that the Nickel Plating IAC should serve as a continuing means for exchanging views between the industry and Government so as to assure fair and equitable distribution of nickel to platers.

*Harry B. Sharpe*, deputy director of the BDSA Miscellaneous Metals and Minerals Division, presided at the meeting. The following industry representatives were present:

*E. J. Driscoll*, Driscoll and Co., Chicago, Ill.

*D. J. Griffin*, Birmingham Plating Works, Birmingham, Ala.

*Joseph Gurski*, Ford Motor Co., Dearborn, Mich.

*M. B. Hammond*, Rockwell Spring & Axle Co., Coraopolis, Pa.

*A. E. Howe*, General Electric Co., Schenectady, N. Y.

*A. T. Leonard*, Superior Plating, Inc., Minneapolis, Minn.

*C. F. Nixon*, General Motors Corp., Detroit, Mich.

*John Palik, Jr.*, National Plating Corp., Cleveland, Ohio.

*Mariano Ranno*, Imperial Plating Co., Brooklyn, N. Y.

*Thomas Stoddard*, Speakman Co., Wilmington, Del.

### Electroplating Design, Inc. Changes Name

It was recently announced by *Elec-*


*the first practical gold plating process for industrial application*

Sel-Rex®

BRIGHT GOLD PROCESS

NOTE THESE EXCLUSIVE FEATURES:

- *Mirror-bright deposits regardless of thickness. No scratch brushing, burnishing or buffing are required.*
- *Hardness of 114-116 Vickers—twice that of conventional 24 K gold deposits.*
- *Denser than conventional gold. One gram of Sel-Rex does the job of 2 grams of ordinary 24 K gold on specification plating.*
- *Exceptional metal distribution and greater throwing power—smooth, uniform deposits even in blind holes and crevices for unmatched economy.*
- *Economical operation. Plates at room temperature. Either rack or any standard barrel—no need to duplicate facilities.*

*Write for Bulletin No. BG-6.*

*Precious Metals Division*

SEL-REX CORPORATION

NUTLEY 10, NEW JERSEY

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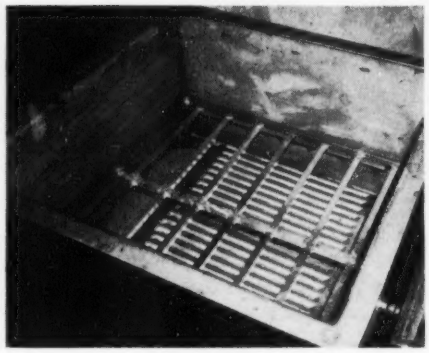

*Invest in Storts Experience*

Storts weldmen have fabricated thousands of composite units like the one shown here—stainless tank with carbon steel outer jacket, insulation in between, stainless thermo-panel, aluminum work rack. Features are dimensional accuracy, structural integrity and complete customer satisfaction.

STORTS WELDING COMPANY INCORPORATED

38 Stone Street
MERIDEN, CONN.

*Manufacturers of Welded Fabrications to Specification*

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*troplating Design, Inc.*, that the name has been formally changed to *Bart Laboratories & Design, Inc. A. G. Buschow* will continue as vice president and chief engineer, and *Dr. D. S. Carr* has been appointed director of research. The company will continue to operate in its facilities at 231 Main St., Belleville 9, N. J., engaging in electroplating consulting and research, design of special plating equipment, and plating plant design.

In 1945, Dr. Carr received his BS degree in chemistry from Loyola College, Baltimore. He studied chemical engineering at the John Hopkins University, Baltimore, where he was awarded the Master's degree in 1948 and the degree of Doctor of Engineering in 1950.

From 1949 to 1952 he was employed as a research chemist at the International Nickel Company Research Laboratory in Bayonne, N. J. where he was engaged in electroplating research. In 1952 he became assistant director of electrochemical research for the Bart Mfg. Corp. where he developed hard nickel coatings for propeller blades and directed research on electroforming, high temperature protective coatings, and welding of nickel-plated steel pipe, fittings, and plate.

Dr. Carr is chairman of the national Electroplating Course Committee of the American Electroplaters' Society and is second vice president of the Newark Branch. He is also an active member of The Electrochemical Society, ASTM Committee B-8, American Chemical Society, and is listed in "American Men of Science" and "Chemical Who's Who."

Mr. Buschow has been associated with the firm since 1944. His duties have included the design and supervision of construction of both large and small plating plants. Some of the plants have been for the Atomic Energy Commission and their main fabricators. Other responsibilities have been the development and design of high-speed plating machines for electroforming.

Prior to his association with the company, Mr. Buschow was a design engineer for the Manhattan Project (Kellex Corp.) where he worked on the secret designs which contributed to the successful operation of the atomic energy plants at Oak Ridge, Tenn.

### G. E. Hauer Joins Infilco

Formation of a new department in response to increasing interest in industrial water and waste treatment and appointment of *G. E. Hauer* to head up its activities is announced by *Infilco, Inc.*

A graduate in civil and sanitary engineering from the University of Michigan, "Jerry" Hauer brings to his new position a background of practical experience in the field. He was engineer and chemist for the city of Grand Rapids, Mich. before he joined the General Chemical Division of Allied Chemical and Dye Corp. Most recently he has been vice-president of American Well Works.

The new division will handle the special applications of the company's equipment for liquids treatment in the rapidly expanding industrial field. Working in close cooperation with the firm's research and development de-

FORMAX
ZIP-TIP BUFFS

The radial segment construction of the Zip-Tip Buff permits it to perform equally well on flat or contoured surfaces. The cross-cutting movement of the spoke-shaped segments prevent work streaking while it breaks up straight-line patterns on the surface.

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partment, the new division will study marketing techniques and special promotion of developments in the fields of water and waste treatment.

### Tube Reducing Appointed Exclusive Agent for Niphos Process

*Tube Reducing Corp.*, Wallington, N. J., has announced that it has been appointed exclusive licensee for the manufacture and application of the newly-developed Niphos corrosion protection coating for ferrous metals. Originated and perfected by the New York Testing Laboratories, the process is, in essence, a low-cost method of applying nickel alloy to mild steel to prevent corrosion and impart many of the essential characteristics of stainless steel to ordinary mild steel.

### Atlas Mineral Opens New Office

*The Atlas Mineral Products Co.*, Mertztown, Pa., has announced the opening of the company's new branch engineering office, at 5907 Penn Ave., Pittsburgh 6, Pa., The office will be in charge of *Thomas K. Piper*, who was appointed its engineering manager.

Before joining the firm, Mr. Piper spent 15 years with the United States Steel Corp. in mill maintenance and engineering. For the last six years, he has served as vice-president and general manager of the Chemsteel Construction Co., Inc., a Pittsburgh contracting concern which was formerly an Atlas subsidiary. Mr. Piper is an engineering graduate of the University of Pittsburgh. He will be responsible for all engineering and design work done at the Pittsburgh office. The

Thomas K. Piper


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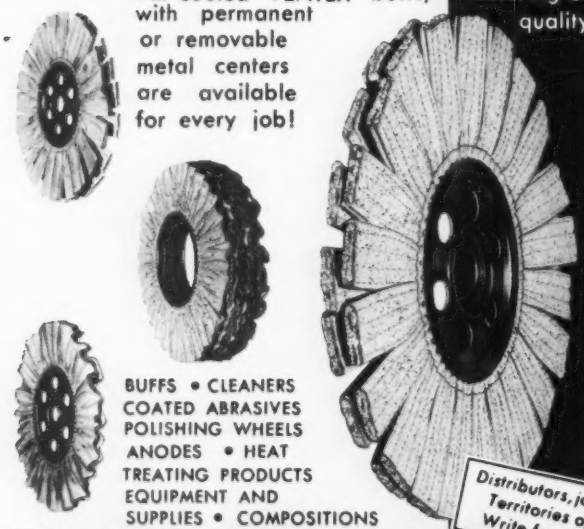

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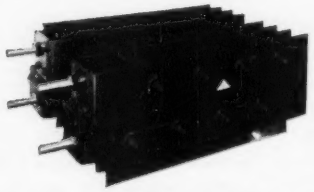

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Pittsburgh district sales office of the company will continue to be under the direction of *C. P. Burns* but will move into the same quarters with the branch engineering office. The new telephone number is EMerson 2-4811.

## News from California

By Fred A. Herr

A group of his fellow members of Los Angeles Branch of the A.E.S. and co-workers at the Hall-Mak Co. where Don has served as factory superintendent and plating supervisor for many years, gathered at the pier of the Matson Liner S. S. Monterey at Wilmington in Los Angeles Harbor on the afternoon of June 5th to bid bon voyage to Mr. and Mrs. *Don Bedwell.*

Don and his lady fair left that day on a six weeks tour of the South Pacific, New Zealand and Australia. Long in the planning stage, and, like other of Don's vacations, dependent upon when he could get away from the plant, the ocean voyage had been looked forward to by Don and Mrs. Don as eagerly as had their shorter trip to Honolulu two years ago.

This time they are really doing it up right. The trip will include stops at Honolulu, Pago Pago on Tutuilla in the Samoan Islands, Suva in the Fiji, Papeete on Tahiti, and down through the necklace of magic isles that stretch beyond the Tropic of Capricorn, whose mere names on the atlas evoke a tinge of wanderlust in city-bound folks. The outward trip is to conclude with visits to New Zealand and Australia. The Bedwells expected to be back in Los Angeles by about July 20.

---

When this columnist saw Mr. and Mrs. *Glen Beckwith* entering the elevator in the Haas Building at 219 West 7th St., Los Angeles (where the West Coast offices of FINISHING PUBLICATIONS are located) he jumped to the conclusion that Glen was engaged upon some highly technical assignment for Kwik-Set Locks Inc., whom he serves as manager of special sales.

"Technical problem," Glen said amusedly. "Well, I guess you might say it's an extremely technical matter. My wife and I are leaving for the Montreal convention next week and she brought me downtown today to help her buy herself a new hat."

Glen was one of the delegates from Los Angeles Branch, A.E.S., to the Montreal national convention.

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Forty-six technical sessions have been programmed as part of the four-day agenda of the Western Electronic Show & Convention to be held in the Cow Palace, San Francisco, Calif., August 20 to 23.

*Dean A. Watkins* of the Stanford Electronic Laboratories, Palo Alto, program chairman, and *Otto J. M. Smith* of the University of California, assistant chairman, report that more than 200 papers on all phases of elec-


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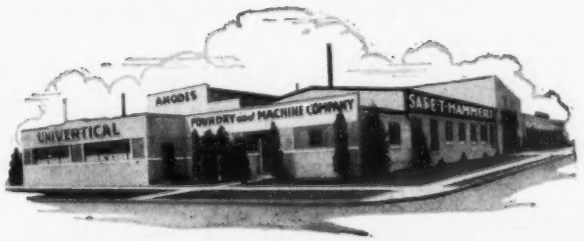


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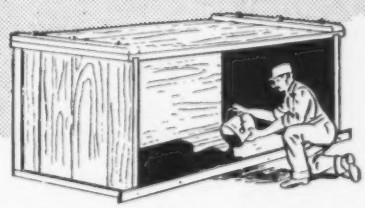

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tronics will be presented, four or five to a session.

---

*George T. Stokes*, president, Glo-Quartz Electric Heater Co., Inc., Willoughby, O., recently dropped this column a line to advise that his firm has appointed Immersion Heating & Equipment Co. of Gardena, Calif., as the exclusive distributor in Southern California for its line of industrial immersion heaters and fused quartz oven heaters.

The Gardena company, according to Mr. Stokes, will supply heaters to plating shop operators of the Southern California area. Mr. Stokes also stated that, in the near future, the heaters will be manufactured in Gardena, Calif., under a licensing arrangement.

The conclusion of the distributorship arrangement with Glo Quartz finds Immersion Heating & Equipment Co. housed in a new plant at 1250 W. 130th St., Gardena, into which the firm moved a short time ago from 8205 S. Alameda St., Los Angeles. The new plant contains 8,000 square feet of manufacturing, office, and warehouse area, which are equipped to assemble and repair all types of industrial heaters, both gas and electric, as well as gas burners and temperature controls. *Robert A. Size* is president, *Howard A. Size*, vice-president, and *Collin Chambers*, chief engineer.

---

*Bert J. Sherwood*, president and general manager of the Chemplate Corp., has announced removal of the firm's manufacturing, processing, and office facilities from 2671 E. 26th St. to larger quarters at 3690 Santa Fe Ave., Los Angeles, Calif. The new quarters provide the company with 18,000 square feet of production area as compared to 4,000 in the former plant. Total investment in the new operating facilities, including alterations on the building, is reported to be in excess of $85,000.

This marks the second expansion move since the firm was founded in 1952 by Sherwood and *Edward Zorn*, the latter now serving as vice-president and sales manager. Operations literally

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started in a bath tub for that was how the first customer's parts were processed in 1952, according to Sherwood. The company specializes in the non-electrolytic deposition of a hard nickel alloy on metallic surfaces, using the name "Chemplate" for the process. While much of the company's work is done for aircraft and electronic firms, many other part manufacturers of Southern California are now among its customers. *Donald Van Zile* is plant superintendent, and *W. R. Hoyt*, assistant superintendent.

---

Engineers of Lockheed Aircraft Corp. of Burbank, Calif., in collaboration with technicians of Anadite, Inc., a South Gate, Calif., plating firm, are reported to have solved the problem of embrittlement in cadmium plating.

Spokesmen for the two firms state that through the vacuum deposition of cadmium on steel parts, hydrogen embrittlement has been completely eliminated. A new vacuum plating method, developed by Lockheed and Anadite after considerable research, is reported to meet all specifications of electrolytic plating, such as corrosion resistance, adhesion, etc.

According to *Gordon Jenkins* of Anadite, Inc., codeveloper of the process, deposits of 0.0003" to 0.0005" can be maintained uniformly and deposits greater than that can be produced if desired. The throwing power of the vacuum process is reported to exceed that of conventional plating and an almost completely uniform coating is obtained in both high and low areas in recessed places.

Current production consists of coating steel parts for the forthcoming Lockheed Pro-Jet Electra with a psi in excess of 180,000. Engineers who collaborated in development of vacuum cadmium plating are Mr. Jenkins and *Glenn Boehmer* of Anadite, Inc., and *Erick Berger* and *Vern Dress* of Lockheed Aircraft Corp.

---

Kelite Co. reports the appointment of *John A. Mowrer* as equipment product manager in the western states territory encompassing the California, Arizona, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming and Western Texas. Mowrer was formerly active in sales capacities with the Marquette Mfg. Co., Packard, and Chrysler.

---

*Carl F. Graham* has been named director of research and development for Turco Products, Inc., Los Angeles, manufacturers of specialized industrial and processing compounds and chemicals. Graham's technical background includes 16 years as manager of analytical research for Wyandotte Chemical Corp., and a tenure as manager of the Kansas City laboratory of Proctor & Gamble.

## Associations and Societies

### AMERICAN ELECTROPLATERS' SOCIETY

#### Newark Branch

Ladies Night was held in Newark on April 26th with just under 100 in attendance. During a brief business


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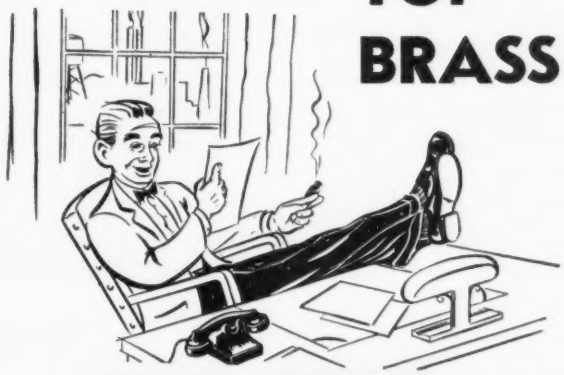

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meeting, *Gregory Martusevich* of Amco Research, *William McLaughlin* of H-VW-M and *Robert Goodman* of du Pont were elected members and five applications accepted. *Melvin Spitalny* was suspended and the resignations of *Joseph Campana*, *Frank Klemm* and *Ed Mansfield* accepted. *Martin Blumenfeld* was transferred to New York and *Anthony Rotoli* to Dallas.

*Fred Meyer*, librarian, then took over the program, first superintending the door prize drawing for the Ladies, assisted by *Louis Donroe* and *Don Foulke*. Winners were Mesdames Azzolino, Korbelak, Kincaid, LaManna, Cobb, Porter, Prine, Ehrhardt, Foulke, Lux, Hallett, Carr and Rack and Miss Polenz of door prizes donated by *Cy LaManna* of American Sound, *John Kosmos*, *George Wagner* of Hy-Grade Electroplating, *Dodd Carr* of Bart Laboratories, *George Reuter* of Wiss and Sons, *Fred Meyer* of M.G.M. Records, *Don Foulke* of H-VW-M, *Al Korbelak* of Sel-Rex Corp., *Gus Bittrich*, *John Banta* of Oakite and *Howard Cobb*.

*Joseph Edelman* of the Hypnotism Center of New Jersey then lectured on and demonstrated hypnotism to the members, wives and friends of the Branch.

The meeting closed with refreshments, while a number of people bombarded Mr. Edelman with questions on hypnotism.

*D. Gardner Foulke*

### Pittsburgh Branch

The annual Ladies Night Banquet of the Pittsburgh Branch was held at the Gateway Plaza in Pittsburgh's Golden Triangle April 27. A fine gathering of 300 persons made the affair one of the most successful in recent years. Co-chairmen of the event were *R. M. Burford* of Pennsalt and *F. W. Mountain* of Hanson-Van Winkle-Munning. After cocktails a filet mignon dinner was enjoyed by all.

Following dinner *Leo Schmitt*, toastmaster for the evening, introduced the 1956-57 president *Myron Ceresa* and presented him the Past-Presidents' Pin. Mr. Ceresa then called forth *Frank R. Keller* and presented him with his Honorary Membership Scroll.

Mr. Keller was elected to Honorary membership at the October meeting of the Branch. At present Mr. Keller is administrative assistant to the president of the Standard Steel Spring Division of the Rockwell Spring and Axle Co. He has been with the company since 1935 and has always been active in the field of metal finishing. From 1937-1943 Mr. Keller was secretary-treasurer of the branch and was president in 1946, during which time the National Convention was in Pittsburgh. He is still a very active and willing worker of the branch.

The new president, *I. H. Schram*, was introduced by *Leo Schmitt*. Then the remaining officers for 1957-1958 were introduced. The drawings for the door prizes preceded the dancing to the orchestra of Lee Kelton which rounded out the evening.

*Fred Stevens*
Secretary


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### Los Angeles Branch

*George Fox*, assistant sales manager, Chem-Mill Division, Turco Products, Inc., presented a talk on the Chem-Mill process of etching aluminum, steel, and titanium as the feature attraction of the educational session of Los Angeles Branch, American Electroplaters' Society's meeting on May 8.

The discussion was arranged by Librarian *Frank Virgil* because the process has drawn considerable attention in metal fabrication and finishing circles during the past several years.

The speaker passed around for examination various types of aluminum and stainless steel airplane parts in the form of tapered rods, flanges, tie plates and panels that had been etched by the process.

The meeting was attended by 95 members and guests. The new branch president, *George Magurean*, presented last year's president, *E. Truman Stoner*, with the past-president's pin.

It was announced that *Earl W. Arnold*, member of the board of managers, was recuperating from a stomach ailment which confined him to his home for several weeks. Earl, an inveterate cigar smoker, suffered the greatest hardship, it was reported, when the doctors put him on a no-smoking regime.

New members inducted at the May 8 meeting were *Louis F. Barkley*, *Charles A. Simon* and *William P. Dugan*. Applications were received from *William H. Stoddard*, *Andrew Nosty* and *E. M. Mills*.

Sergeant-at-arms *Milton Weiner* introduced the following guests: *Frank Krenze*, *K. R. Kelso*, *J. M. Clodjear* and *L. T. O'Connor* of the Braun Corp; *J. B. Blackburn*, Oakite, Inc.; *T. Brewer*, North American Aviation, Inc.; *William Mocoe*, Metal Surfacing Co.; *J. M. Rafferty*, North American Aviation, Inc.; *David M. Wassit*, Axelson Mfg. Co.; *Syd Smith*, Kelite, Inc.; *Bruce Sloggett* and *Stuart Clark*, Turco Products; and *Andrew Nosty*, Anadite, Inc.

Los Angeles Branch's final meeting prior to the summer recess was to be held June 12 in the officers' dining room of the Rheem Mfg. Co. in Fullerton, Calif. A guided tour of Rheem's 4 million dollar plating and polishing installation for use on automobile bumper's was to follow the dinner meeting. The branch will resume regular monthly meetings on September 11 at Rodger Young Cafe in Los Angeles.

### British Columbia Branch

The general meeting on May 24, 1957 was held at Leonard's Cafe as a dinner meeting with general business meeting commencing at 8:00 p.m.

*Neil Holman* reported on his committee's work to date re night school course in the fall. His committee, composed of *Reg. Irwin*, *Bill Marquardt*, *Walter Kellerman* and *Dave Titmouse* had worked out tentative details as follows: 22 to 24 evenings commencing Sept. 30 approximately including — introduction, electrical, polishing & buffing, various solutions and laboratory work. The location was not settled but instructors would be Walter Kellerman and Dave Titmouse.

The secretary outlined arrangements


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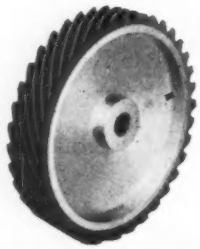

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Mr. Marquardt introduced the speaker, *Dr. Lawrence Young* of the B.C. Research Council. Dr. Young mentioned services provided free by the council before going on to his main topic. This was the preparation of thin films on tantalum and aluminum by electric current, which films because of their thinness and electrical resistance were excellent for condenser manufacture where small size was needed. This film also was available in any color depending on the length of time in the solution.

### Chicago Branch

The regular monthly technical and business meeting of the Chicago Branch was held on May 10 at the Western Society of Engineers, 84 East Randolph St. As an experiment to see what effect a more central location based on the residence of the membership would have on attendance, it was decided to hold the June meeting at Nielson's Restaurant on North Ave. The members are enthusiastically looking forward to a change in location, good food, and ample parking.


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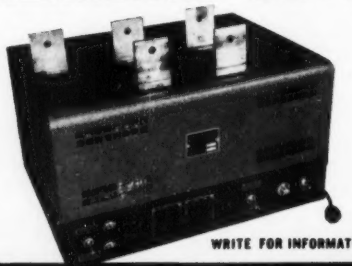

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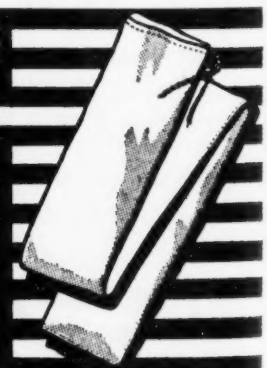

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Speaker of the evening was *Allen Klomps*, whose subject was "Production Experiences in PR Copper Plating". Mr. Klomps spent considerable time describing the equipment (filtration, agitation, electrolytic purification, and diaphragm tanks). After this very interesting presentation, *Barney Case*, supt. of Sunbeam Corp., joined in to help Mr. Klomp in the lively question and answer period that followed.

*J. C. Corre*

### Unaffiliated Group

The third meeting of the unorganized group of electroplaters of the Blue Ridge, Va., area met at the Town Steak House, No. 2, Winston-Salem, N. C., on Friday, May 10, 1957. After an excellent dinner, the meeting was addressed by *Barnet D. Ostrow* of Lea-Ronal, Inc. The subject of his talk was silver plating. He described the various baths that have been used, the properties of these baths, the properties of the deposits, and conditions, analysis and maintenance of the baths. After the talk Mr. Ostrow was bombarded with many questions from the 49 people who attended the meeting.

*Bruce Wallace*, of the Bassick-Sack Co., Division of Stewart Warner, acted as chairman for the meeting. *Fred Fulforth*, past-president of the Supreme Society, now a resident of Atlanta, Ga., was a guest at the meeting and spoke encouraging the organization of a section of the American Electroplaters' Society. *T. R. Boggess* and *Dr. N. F. Murphy* described the pro-


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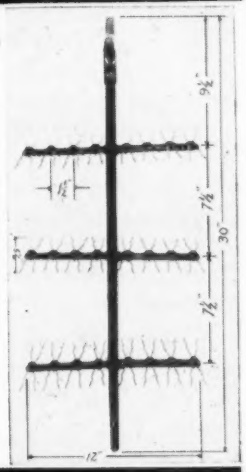

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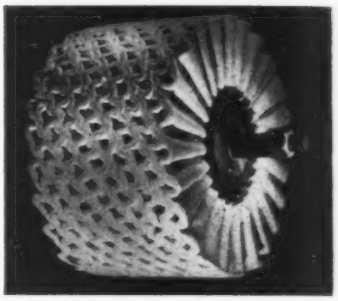

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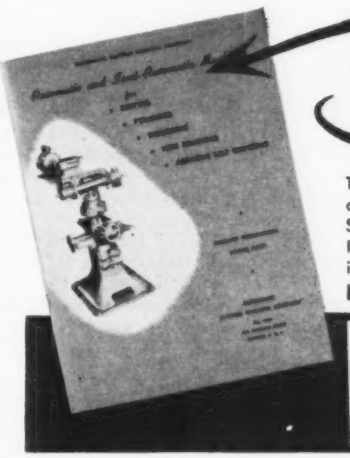

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grams of the Society and encouraged active participation in their work. *H. R. Welfare* introduced the speaker. Refreshments before the dinner were the courtesy of the Reynolds Co. of Philadelphia, Pa., and of *G. W. Coan, III.*

During the afternoon, before the meeting, 21 visitors inspected the Bassick-Sack electroplating facilities. The success of this inspection was the result of arrangements by *Leonard Duggins, Jerry L. Kelly, Sr., Jim Kennerly,* and *Bruce Wallace,* all of the Bassick-Sack Division.

*Nelson F. Murphy*
Acting Secretary

### Newark Branch

A meeting of the Newark Branch was held on May 17th at 8:00 P. M. with President Grigat presiding. Elections to the branch were: *Anthony Agostine* of F and B Metal Plating Co., *Charles Busacco* of Aircraft Engineering Products, *John B. Hall* of Van Straaten Chemical Co., *Clinton Ivins* of H-VW-M, and *Charles Rack* of Oakite Products, Inc. Two applications were turned over to the board of managers for action.

The secretary reported with deep regret the passing of *Royal Clark,* founder member of the AES, honorary member and past president of the Newark Branch, and that condolences will be expressed to Mrs. Clark on behalf of the Branch.

Secretary *Don Foulke* reported a communication from an insurance agency and an interview with an underwriter re the need in the plating industry for insurance against spoilage of work. Interest was expressed by a number of members and it was generally agreed that this was a problem which could be worked out with NAMF.

Librarian *E. Meyer* then introduced *Charles Rohleder* of Maas and Waldstein who spoke on "Recent Developments in Organic Coatings." The various resins used for different applications such as silicones, vinyl, epoxys, polyesters, urethanes, and chlorinated rubber were covered. Advances in clear lacquer, air dry and baking, and new type coatings such as multi color enamels were described.

*Sidney Weisman* of Curtiss-Wright Corp., Propeller Div., spoke on "Hydrogen Embrittlement". He covered the various theories proposed to explain hydrogen embrittlement and proposed one of his own. Wedding the theoretical and practical, Mr. Weisman described the effects of hydrogen embrittlement, how it is determined, how to reduce the effects once you have it and, finally, steps that can be taken to minimize this condition.

*D. Gardner Foulke*
Secretary

### N. A. C. E.

Various technical aspects of the application and use of industrial coatings and linings will be discussed this fall at meetings of the National Association of Corrosion Engineers. The meetings will be held at Oklahoma City, Chicago and Pittsburgh.

At Pittsburgh, during the North Central Region meeting November 12-14, 1957 at the Penn-Sheraton Hotel, Unit Committee T-6F on Protective Coatings Equipment, Methods and Costs will meet.

At Oklahoma City, during the October 1-4, 1957 South Central Region Meeting at Municipal Auditorium, Technical Committees T-2D on Measuring Pipe Coating Conductance; T-2G on Coal Tar Coatings for Underground Use; T-2K on prefabricated Plastic Film for Pipe Line Coating; T-6A on Organic Coatings and Linings for Resistance to Chemical Corrosion; T-6B on Protective Coatings for Resistance to Atmospheric Corrosion; T-6D on Industrial Maintenance Painting; T-6E on Protective Coatings in Petroleum Production will hold sessions.

A symposium on protective coatings also will be held during this meeting with *L. G. Sharpe,* Napko Corp., Odessa, Tex., as chairman.

### San Joaquin Section Becomes Fifty-third Organized by NACE

The fifty-third local section of the National Association of Corrosion Engineers was organized at Bakersfield, California, April 24, 1957. The Association actually is international, with five sections in Canada.


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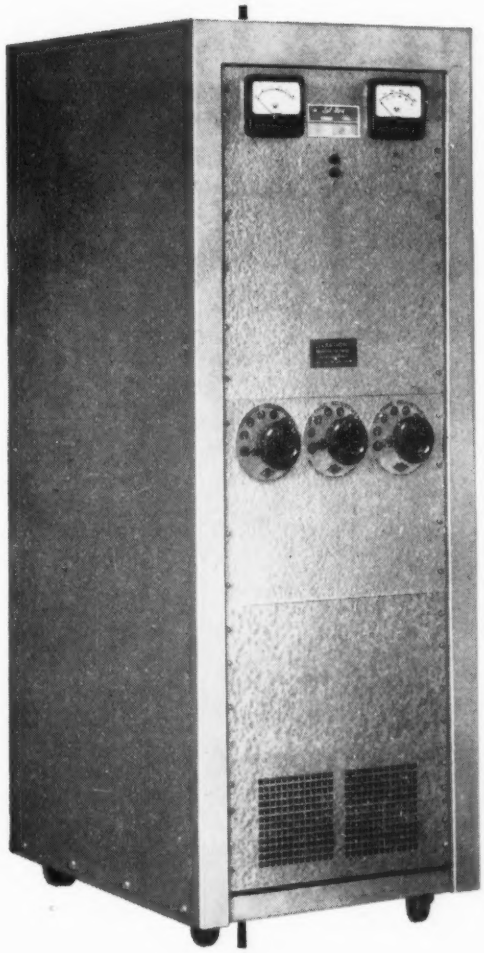

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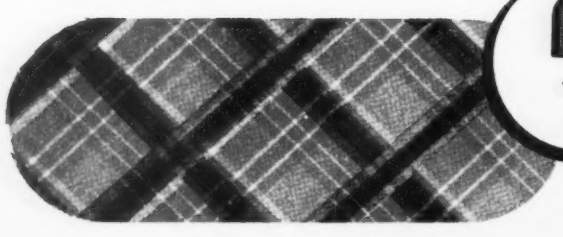

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